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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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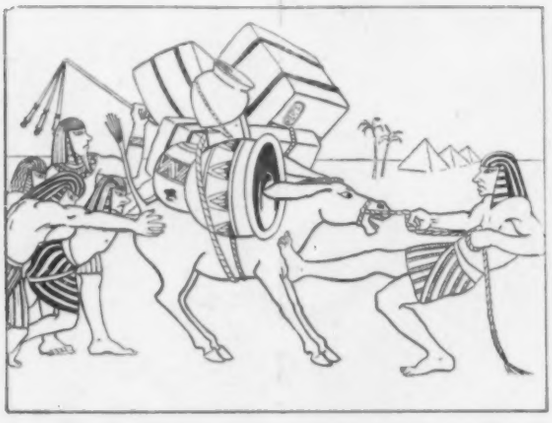
EGYPTIAN



FOUR thousand years ago moving was no joke. The facilities at hand were entirely inadequate for the purpose and travel was slow.

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THE
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VOL. 22 NEW YORK, NOVEMBER, 1924 No. 11

The Foundry Convention

A Report of the Joint Meeting and Exhibition of Foundry Equipment, Held in Milwaukee, Wis., October 11-16, 1924.

The Joint Convention of the American Foundrymen's Association and Institute of Metals Division, held in Milwaukee, October 11-16, 1924, proved to be one of the most successful conventions ever held. The attendance broke all records, totaling over 5,000. The method of arranging the exhibits was similar to that of the Cleveland Convention, held in May, 1923, at which all the molding machines and noisy apparatus were placed on the floor below the Exhibition Hall, while the others were located in the arena on the ground floor.

The local committee drawn from the Milwaukee Trades and Founders' Association, and the Milwaukee Association of Commerce, prepared an elaborate programme for the members and visitors which kept everyone busy and most satisfactorily entertained. A special programme was arranged for the ladies. The general arrangements, such as plant visitation, golf matches, theatre parties, etc., went off with perfect smoothness.

EXHIBITS

Among the exhibitors showing new or unusual equipment and supplies were the following:

F. A. Coleman Company, Cleveland, Ohio.—Continuous electric core ovens.

Curtis Bay Copper and Iron Works, Baltimore, Md.—Everbrite metal—a synthetic alloy of the cupronickel type for resistance to corrosion, and abrasion.

Lava Crucible Company, Pittsburgh, Pa.—A line of super refractory furnace specialties including furnace cements, furnace covers, base blocks, furnace linings, special shapes and brick.

MacLeod Company, Cincinnati, Ohio.—Sand-blast apparatus.

Milwaukee Foundry Equipment Company, Milwaukee, Wis.—Molding machines for brass foundries.

Modern Pouring Device Company, Port Washington, Wis.—Apparatus for pouring metals from crucibles.

Ruemelin Manufacturing Company, Minneapolis, Minn.—Sand-blast equipment of all sorts.

Skybryte Company, Cleveland, Ohio.—Cleaners for factory and foundry windows.

The electric furnace industry showed a healthy expansion. The **Detroit Electric Furnace Company** now has 172 installations, totalling 30,000 K.W. The **Ajax Metal Company** now has 400 Ajax-Wyatt furnaces installed using a total of 24,000 K.W.

Descriptions of some of the exhibits will be found on pages 458-460 of this issue.

TECHNICAL PROGRAM

SESSION NO. 1—JOINT MEETING—BRASS FOUNDING

MONDAY, OCTOBER 13, 1:30 P. M.

PLANKINTON HALL, AUDITORIUM

G. H. CLAMER, CHAIRMAN.

G. K. ELLIOTT, ASSOCIATE CHAIRMAN

The following are abstracts of papers read, dealing with metals.

Making Copper Castings from Cupola Melted Metal

BY T. F. JENNINGS, GARFIELD, UTAH

The author of this paper describes in detail the methods used in making sound copper castings by melting the metal in a cupola. The preparation of the cupola and liberal use of charcoal in the charges is emphasized. A mild blast should be used, the ladles preheated and the metal in the ladle covered with fluid slag to prevent air from reaching the metal. By following directions given, it is stated that successful melting of copper and brass in a cupola should be regularly accomplished.

DISCUSSION

Mr. Decker asked if the large castings showed up sound under machining. Mr. Jennings answered that they did. No blow-holes were found. Mr. Turner asked if the bed of the furnace had to be raised or changed in any way and was answered that it did not. The furnace was used exactly as if a charge of iron had been put into it. Mr. Bregman asked how small an installation of this kind could be operated at a profit. Mr. Jennings answered that it was useful in his own case only when the castings were so large that they could not be made with the ordinary equipment. He added, in answer to other questions, that his losses had been very low, perhaps from 1 to 1½ per cent, and that the pouring temperature ranged from 1,950-2,000° F.

Mr. Elliott told of a steel foundry which melted 5,000 pounds of copper in a cupola when it was necessary to make large castings. Mr. Klenk spoke of melting success-

fully 7,500 pounds at a time of casting containing 89.5 copper, 10 tin, and .5 phosphorus. Mr. Clamer mentioned that cupolas were in use to melt copper-tin-lead alloys for pumps.

Modern Bell Founding

By Wesley Lambert and G. Hall, London, England

This paper is divided into three sections: The first, Historical Notes on Bells, and the third, Metallurgical Notes, are by Wesley Lambert, while the second, Bell Founding, is by G. Hall. The historical notes discuss the early developments of the bell founders' art, which is said to have been lost in antiquity. The introduction of large bells is ascribed to Italy, about the 4th or 5th century A. D. Molding practice in modern bell founding is described, the special processes of sweeping up the cores and the molds in special flasks being well illustrated. Letters of the inscriptions and ornaments are stamped into the mold separately, while the mold face is still soft after the application of "blacking wash." Later the mold is dried and assembled for casting. The metal, par excellence for large bells, is essentially an alloy of copper and tin, the tin ranging from 17 to 25 per cent of the mixture. The rich, sonorous qualities of the bronze used for large bells is said to be due to the characteristic constitution or microstructure of the metal in general use for this class of bells.

DISCUSSION

This paper was presented by Mr. Minich for the author. A written discussion was received from Mr. McNeely stating that the practice in his firm was to use a mixture of 78 copper, 22 tin, all new metals. He stated also that in his opinion the paper really showed the ancient rather than the modern practice. In his own plant, when a bell-casting job was undertaken, a number of extra bells were cast, and then those which were best suited by tone for their set were chosen. The others were sold for single bells. This eliminated chipping and scraping.

Dean Connelly spoke in appreciation of the author for sending in this paper. It was a mark of the friendly relations existing between the United States and Great Britain, which these exchange papers helped to strengthen. He also spoke of the value of the molder as a citizen, and pleaded for a higher appreciation of the dignity of this type of work.

Mr. Root pointed out that the best bells (carrillons) were almost invariably obtained in England, like the Cohassett carrillons. Not only were the primary tones of these bells correct, but the secondary tones had to be made sure of before the bells could be used. Mr. Estep spoke of the authors as highly skilled and scientific workers. He explained that the scrap mentioned in the paper had been carefully ingoted and analyzed before using.

Art Bronze Work

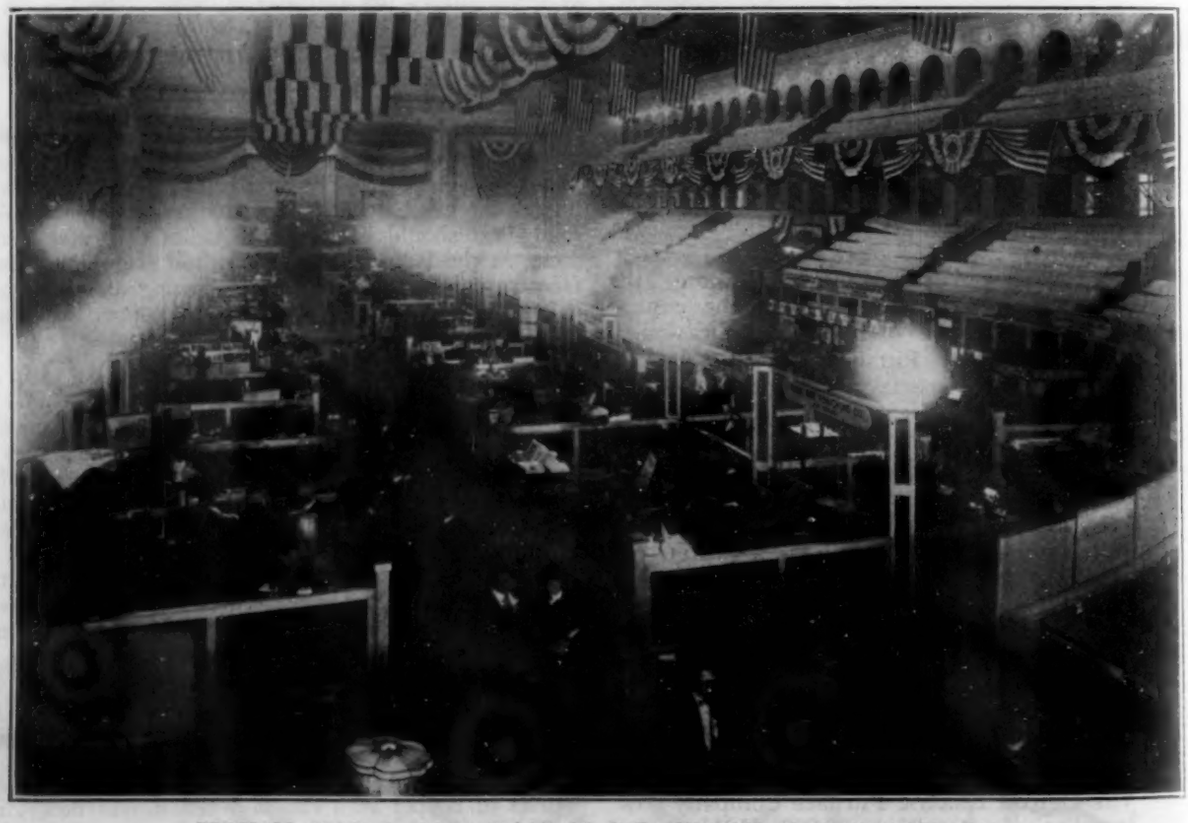
By J. F. Arnold, Mt. Vernon, N. Y.

This paper was presented by title only, due to the absence of the author. It gives in detail the necessary preparations for casting and the operations involved in making the mold and pouring a statue. It will be published in full in a later issue of The Metal Industry.

The Founding of Brass in Mexico

By H. A. Miller, Torreon, Coah, Mexico

This paper was also presented by title. It described economic conditions among the Mexican brass foundries and some of the difficulties with which they have had to deal. It gives a good idea of Mexican practice, and is of considerable value to those either contemplating a brass foundry business in that country, or the sale of foundry equipment.



EXHIBITS ON THE ARENA FLOOR OF THE AUDITORIUM, MILWAUKEE, WIS.

The Copper Refining Industry

By G. F. Stanton, Sales Manager, Baltimore Copper Smelting & Rolling Company, Baltimore, Md.

This subject was covered by means of motion pictures, explained by Mr. Stanton. He showed the importance of the copper industry giving the statistics as to the tonnage of copper used in this country. The pictures were very well taken and proved of great interest to the meeting.

Report of Committee on Non-Ferrous Metals

By J. L. Jones, Pittsburgh, Pa.

Mr. Jones reported that this committee was co-operating with Committee B-2 of the American Society for Testing Materials. It had taken up test bars, bearings, aluminum alloys, fluxes, and phosphor alloys. He recommended for future subjects to be taken up, the following: permanent molds, centrifugal casting, die casting, green sand molding, and dry sand molding. He also recommended that the work of the committee should be expanded, but along the lines of processes rather than testing methods.

The report was unanimously adopted by the meeting.

SESSION NO. 3—JOINT MEETING—ALUMINUM ALLOYS

Tuesday, October 14, 9:30 a. m.

Plankinton Hall, Auditorium

W. M. Corse, Chairman

L. W. Olson, Associate Chairman

The Production of Aluminum-Alloy Pistons in Permanent Molds

By Robert J. Anderson, Boston, Mass., and M. Edward Boyd, Clinton, Mich.

The production of aluminum-alloy pistons in permanent molds is discussed in some detail in this paper, and the operating principles of such molds are described. Various types of piston molds—American, English and French—are discussed. The effects of the most important variables on the production of sound castings free from defects, such as blowholes, overlaps, air holes, cracks, etc., are considered, and methods for preventing the occurrence of such defects are given. The design of molds on the basis of a consideration of the desired flow of liquid alloy on pouring is taken up, and the general principles of satisfactory design are elucidated. The effect of heat treatment, i. e., simple annealing, in overcoming permanent growth and distortion of pistons is discussed briefly, and typical methods of machining pistons are described. A resumé is given of an investigation on methods of gating pistons and on the effects of mold temperatures and pouring temperatures upon the occurrence of air holes, overlaps, cracks, and related defects. Conclusions based on experimental work are drawn.

DISCUSSION

Dr. Basch stated that in his opinion the permanent mold process was not sufficiently appreciated in the foundry. Present die casting methods were not suitable for castings requiring considerable strength since they were subject to blow-holes and pipes. Permanent mold castings can be permanent, sound and uniform.

It was stated during the discussion that it would pay to cast by the permanent mold method as few as 50 automobile pistons per day since a large part of the machining would be saved. Some iron was picked up during the casting operation, but this came largely from the pots. If the aluminum was high in silicon, the iron might run up to 1.5 per cent; if not, it might be as low as .2 per cent. Little or no iron came from the molds.

Foundry Treatment and Physical Properties of Silicon-Aluminum Sand Castings

By D. Basch and M. F. Sayre, Schenectady, N. Y.

The authors discuss the developments during the last four years of a series of silicon alloys of aluminum which have high physical properties and exceptionally good foundry properties. A very low shrinkage coefficient, freedom from hot shortness and a very high fluidity combine to permit the casting of large and intricate sections not previously attempted. With these properties is found to be present a relative freedom from porosity and a good resistance to atmospheric corrosion. On the other hand, certain disadvantages are noted which limit their field of usefulness. As the authors state, it is considered that these alloys are bound to be of increasing importance, and it is felt that a description covering particularly their physical properties and foundry technique and modifications necessary when changing to these alloys from others will be of value.

A New Aluminum Alloy—Alpax

By Leon Guillet, Paris, France

Translated by Robert J. Anderson, Boston, Mass.

This paper discusses the new aluminum-silicon alloys which have recently been brought out in the United States, and which have been coming into use in the United States, France and Germany during the past three years. It is pointed out that there is need for a light aluminum alloy having better mechanical properties than the ordinary commercial casting alloys which have been used heretofore, and this need has apparently been met in the 86.5:13.5 aluminum-silicon alloy, i. e., so-called alpax. The method of preparing this alloy according to the patents of Pacz is described, and the aluminum-silicon alloys are discussed in general, attention being given to the history of the alloys, their constitution, microstructure, and mechanical properties. Many test data are given in tabular form for the mechanical properties of alpax in the cast and worked conditions. The effect of annealing on the microstructure and hardness of the alloy is discussed. The question of machining is taken up briefly, and attention is directed to recent industrial applications of the alloy.

DISCUSSION

These two papers were discussed together since they treated of what was, in a general way, the same subject. A written discussion was received from Mr. Archer, of the Aluminum Company of America, in which he differed on a number of points from Messrs. Basch and Sayre. Some members present asked other questions, such as the advisability of using antimony or bismuth instead of sodium for modification, and there was some disagreement on the merits of sodium and sodium fluoride for that purpose. Mr. Pacz gave it as his firm opinion that neither antimony nor bismuth would work.

Dr. Basch spoke in answer to questions and criticisms offered by Mr. Archer. One point was the possibility of getting 8 per cent elongation and 25,000 pounds tensile strength. Mr. Archer had stated that 8 per cent was too high, offering 5 per cent elongation as the reasonable maximum. Dr. Basch pointed out that the General Electric Company had been able to get 8 per cent elongation regularly and favored standardizing the requirements at a high figure. The Government has also standardized at 8 per cent. As regards the question of sodium versus sodium fluoride for modification, he explained that the General Electric Company had tried both quite impartially, having no interest in either method, and that it had found the method recommended by Dr. Pacz, covering the use of sodium fluoride to be best.

Aluminum Alloy Castings from Sheet Scrap

By Horace C. Knerr, Philadelphia, Pa.

The purpose of the paper is to outline the methods by which a small foundry, started on an experimental basis, succeeded in meeting the requirements for sound and dependable aluminum alloy sand castings, using only scrap aluminum and copper sheet metal. The castings made were required to meet the government specifications corresponding approximately to S. A. E. specifications No. 30. Satisfactory results were obtained through careful temperature control, exclusion of furnace gases from the metal, and other simple precautions. The production of aluminum alloy castings of good quality was found entirely practicable under these circumstances.

DISCUSSION

Dr. Blough, of the Aluminum Company of America, sent in a written discussion. He recommended cast iron pots as best for general use with aluminum alloys and also urged that a heel of metal be kept in the pot at all times so that fresh scrap could be pushed down into it to prevent undue oxidation.

Salvage and Reclamation of Aluminum-Alloy Castings by Soldering and Welding

By Robert J. Anderson, Boston, Mass., and M. Edward Boyd, Clinton, Mich.

The salvage of defective aluminum-alloy castings by soldering and welding is discussed in this paper. It is shown that the problem of reclaiming wasters is of great economic importance in foundry practice, and in the aluminum-alloy casting industry some $1,000,000 per annum can be saved, if half of the defective castings produced are reclaimed. Typical salvage instructions to apply in reclaiming bad castings are given, and the metallurgical aspects of fusion welds and soldered joints made in aluminum-alloy castings are discussed. Welding is preferable to soldering in repairing defects, and soldering has very little legitimate application in reclamation. Typical microstructures of fusion welds and soldered joints are shown.

DISCUSSION

Mr. Jones recommended as the best aluminum solder, the mixture known as Richards solder consisting of aluminum 3.5, tin 71.5, zinc 25, and phosphorus, trace.

At the Hamburg Convention in Germany last year aluminum castings were shown which had been reclaimed by a modification of the Schoop process, giving these castings fully the strength of cast aluminum.

SESSION NO. 7—INSTITUTE OF METALS—NON-FERROUS

Tuesday, October 14, 1:30 p. m.

Englemann Hall, Auditorium

G. K. Elliott, Chairman

J. L. Jones, Associate Chairman

Casting and Heat Treatment of Some Aluminum-Copper-Magnesium Alloys

By Samuel Daniels, Met. E., A. J. Lyon and J. B. Johnson, Dayton, Ohio

Aluminum-base alloys containing small amounts of copper and magnesium possess but ordinary physical properties as sand cast, but may be treated to give a remarkable range of tensile values and of Brinell hardness. The high-copper (4.5 per cent) duralumins must be given a protracted treatment which in nature resembles the malleabilizing of white cast iron; the low-copper (2.25 per cent) duralumins develop an excellent combination of strength and ductility with a treatment which requires a maximum of 5 hr. to be completed.

Experiments on the Heat Treatment of Alpha-Beta Brass

By O. W. Ellis and D. A. Schemnitz, Toronto, Ont., Canada

By reheating alpha-beta brass, which as a result of quenching is retained at room temperature in the condition of homogeneous beta solid solution, it is possible to cause precipitation of alpha in submicroscopic form.

This precipitation of alpha has a deleterious influence on the tensile properties of the quenched brass, but has the effect of increasing the Brinell hardness of the material. This latter phenomenon is felt to be worthy of remark, as the precipitated alpha is appreciably softer than the quenched beta whence it is generated. It is well known that age hardening can be occasioned by the precipitation of hard particles (as in the case of duralumin); reheated quenched brass, however, affords an example of a substance subject to age hardening caused by the precipitation of soft particles.

To put it briefly: while spherical particles, whether soft or hard, are in process of formation the hardness of the alloy will increase, because of the increasing resistance offered to slip (owing to space lattice distortion at the boundaries of the particles) as a result of the precipitation of particles of this form. When the spherical particles begin to change into minute allotriomorphic crystals the hardness of the alloy will tend to decrease and will actually be lowered (1) when the rate of formation of allotriomorphic crystals exceeds the rate of formation of spherical particles and (2) as the allotriomorphic crystals themselves increase in size.

Coatings Formed on Corroded Metals and Alloys

By George M. Enos, Cincinnati, Ohio, and Robert J. Anderson, Boston, Mass.

As the coating formed affects the corrosion rate, duplicate samples of eight non-ferrous alloys were placed in flowing mine water. The alloys tested were as-cast or as-rolled and machined or polished. The paper describes the tests and gives the corrosion losses and the appearance of the samples at the end of the test. The condition of the surface of the alloys examined, as-cast or machined, apparently has little effect on the corrosion rate in mine water.

DISCUSSION

This paper was read by Mr. Bregman in the absence of the authors. Mr. Elliott remarked that the results were interesting to him. He had tested bronze castings in still water and the machined castings had shown no corrosion while the as-cast specimens had been severely corroded. Prof. Sayre stated that under the salt spray he had found no difference in results between the as-cast and machined surfaces. Mr. Daniels said that in his opinion corrosion depended to a great extent on the method of testing. With aluminum alloys the as-cast specimen would corrode less than the machined surfaces. Mr. Elliott mentioned that a buffed specimen of stainless steel had been found to corrode much more readily than a ground surface.

Dr. Basch asked for more information about the exact character of these surfaces. He stated that a perfectly smooth surface, mechanically unstressed, would show very low corrosion. Mr. Daniels corroborated this by explaining that the machined surface that he had mentioned before was not highly polished, but left as it had come from the machine shop.

Notes on the Hardness of Heat-Treated Aluminum Bronze

By George F. Comstock, Niagara Falls, N. Y.

Results are given of scleroscope and Brinell tests on specimens of cast 10 per cent aluminum bronze, quenched

and reheated at various low temperatures. The scleroscope was not found as reliable as the Brinell machine for measuring the hardness, for the size of the piece tested seemed to affect the scleroscope results. The maximum hardness was obtained by quenching and reheating to between 315° and 370° C. Softening was produced by reheating above 370° or 400° C. A series of polished and etched microsections showed a more reddish color in those that had been reheated above 400° C., and a change in microstructure above 500° C.

DISCUSSION

This paper was read by Mr. Jones in the absence of the author. Mr. Jones added that aluminum bronze had been known for a long time, but had been retarded in its general use by the difficulty of handling. It is used at the present time largely for automobile gears, but also for dies to use in contact with steel (to replace steel to steel contacts). It is also used as an anti-acid metal. Mr. Daniels stated that the work at McCook Field checked conclusions reached in the paper. Extruded aluminum bronze lacks uniformity. He added that only a steel carrying 1 per cent carbon, 13 per cent chromium, 2 per cent cobalt and 1 per cent molybdenum would work as well as aluminum bronze under friction. Under one condition in his experience, cast iron had worn .017″ to .035″ while aluminum bronze had worn only from 0″ to .02″. It was also effective for valve guides.

Mr. Bregman asked if there was any comparative data on sand-cast aluminum bronze as against that metal cast in permanent molds. Mr. Jones answered that the permanent mold castings were superior, but that aluminum bronze could be sand cast quite easily, in his opinion, more easily than manganese bronze.

SESSION NO. 8—A. F. A.—SAND RESEARCH

WEDNESDAY, OCTOBER 15, 9:30 A. M.

PLANKINTON HALL, AUDITORIUM

W. M. SAUNDERS, CHAIRMAN

R. J. DOTY, ASSOCIATE CHAIRMAN

The Physical Properties of Foundry Sands

BY C. A. HANSEN, GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

This paper discusses the data of an investigation carried on in an endeavor to correlate most of the measurable properties of a few simple foundry sands, on the principle that a fairly intimate knowledge of a few sands is more useful than a heterogeneous mess of isolated data covering a great many sands. The following properties were studied: green bond (Doty Test), green compression strength, dry cross-bending and dry compression strength, green and dry permeabilities and green and dry densities. The author concludes after reviewing the test results that: (1) green strength is primarily a surface tension affair. Numerically it is a measure of the amount of increased water surface created by the displacement of the sand grains during rupture of a core. It is often confused with viscosity, as in the case where various organic binders are added to core sands to give them apparent strength. Green strength may determine molding characteristics, but rather in the way that high green strength involves sand that will not flow laterally beneath a rammer and thus leads to non-uniformity rammed molds and scabbed castings. It has no bearing upon the capacity of the mold to withstand the action of molten metal. (2) Dry strength determines the capacity of a mold to withstand molten metal. This is true of green sand molds as it is of dry sand molds.

A New Method of Measuring the Hardness of Molds

BY E. RONCERAY, PARIS, FRANCE

A description of the new mold hardness tester developed by the author which was exhibited at the first International Foundry Exhibition in Paris, France, in September, 1923. The device is not yet completely perfected, and the paper was, therefore, rather sketchy. It is based, in general, on the principle of the Brinell tester. A ball is pressed into the mold and the depression measured.

Molding Sand Reclamation and Control Experiments

F. L. WOLF AND A. A. GRUBB, OHIO BRASS COMPANY, MANSFIELD, OHIO

Brass foundry refuse sand is reclaimed by adding small percentages of a very high bond sand. High freight rates have been eliminated by the use of local sands under careful control. Tests show that mulling increases the bond of heap sand, refuse, reclaimed mixtures and new sand mixtures from 30 to 90 per cent. It also closes the sand, but it can again be opened up without material sacrifice of bond by screening or a similar process. This treatment puts sand in excellent condition for molding. The effect of mulling on other characteristics of sand and the relation of these characteristics to bond strength and working qualities are discussed. New and rapid methods for measuring moisture content and tensile bond are described. Reclamation and control methods have been important factors in producing low foundry costs. Both foundry losses and molding sand costs have been reduced more than 50 per cent during the past year.

New Ironless Yacht

According to a report from the Department of Commerce, the hydrographic department of the Esthonian General Staff has chartered an ironless yacht and has commissioned Commander Gernet, the owner of the yacht, to conduct a magnetic survey of the Gulf of Finland and of the Esthonian waters of the Baltic Sea.

The yacht is 14.15 meters long, with a beam of 3.80 meters and 1.55 meters draught. The gross tonnage is 20.18 registered tons. The yacht is made and equipped completely of non-ferrous materials and no articles made of iron or steel are admitted on board. The yacht is rigged as a ketch and has no motor. The surveying equipment consists of the following instruments: one double compass, system of Dr. Bidling-Meyer, for the measurement of the horizontal component; for the measurement of the vertical component—one dipping needle and vertical deflector, system of Major-General Clapier de Colongue, Russian Navy; for the measurement of the declination—one fluid compass with shadow pen and diopter, system Plath, Hamburg. The crew of the yacht consists of a captain, who is also the scientific chief of the expedition, two assistant scientists, four sailors and one cook, in all eight persons.

Commander Gernet was formerly in the Russian Navy and is a graduate of the hydrographic department of the Russian naval school. The present project is reported to be making satisfactory progress, but the results of the expedition have not yet been made available.

This vessel resembles in its materials of construction the Carnegie, an ironless vessel (which was described in THE METAL INDUSTRY for January, 1909). The Carnegie was built to make magnetic surveys, and was much larger than the Esthonian, being 155 feet 6 inches long and having a displacement of 568 tons.

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As the coating formed affects the corrosion rate, duplicate samples of eight non-ferrous alloys were placed in flowing mine water. The alloys tested were as-cast or as-rolled and machined or polished. The paper describes the tests and gives the corrosion losses and the appearance of the samples at the end of the test. The condition of the surface of the alloys examined, as-cast or machined, apparently has little effect on the corrosion rate in mine water.

DISCUSSION

This paper was read by Mr. Bregman in the absence of the authors. Mr. Elliott remarked that the results were interesting to him. He had tested bronze castings in still water and the machined castings had shown no corrosion while the as-cast specimens had been severely corroded. Prof. Sayre stated that under the salt spray he had found no difference in results between the as-cast and machined surfaces. Mr. Daniels said that in his opinion corrosion depended to a great extent on the method of testing. With aluminum alloys the as-cast specimen would corrode less than the machined surfaces. Mr. Elliott mentioned that a buffed specimen of stainless steel had been found to corrode much more readily than a ground surface.

Dr. Basch asked for more information about the exact character of these surfaces. He stated that a perfectly smooth surface, mechanically unstressed, would show very low corrosion. Mr. Daniels corroborated this by explaining that the machined surface that he had mentioned before was not highly polished, but left as it had come from the machine shop.

Notes on the Hardness of Heat-Treated Aluminum Bronze

By George F. Comstock, Niagara Falls, N. Y.

Results are given of scleroscope and Brinell tests on specimens of cast 10 per cent aluminum bronze, quenched

and reheated at various low temperatures. The scleroscope was not found as reliable as the Brinell machine for measuring the hardness, for the size of the piece tested seemed to affect the scleroscope results. The maximum hardness was obtained by quenching and reheating to between 315° and 370° C. Softening was produced by reheating above 370° or 400° C. A series of polished and etched microsections showed a more reddish color in those that had been reheated above 400° C., and a change in microstructure above 500° C.

DISCUSSION

This paper was read by Mr. Jones in the absence of the author. Mr. Jones added that aluminum bronze had been known for a long time, but had been retarded in its general use by the difficulty of handling. It is used at the present time largely for automobile gears, but also for dies to use in contact with steel (to replace steel to steel contacts). It is also used as an anti-acid metal. Mr. Daniels stated that the work at McCook Field checked conclusions reached in the paper. Extruded aluminum bronze lacks uniformity. He added that only a steel carrying 1 per cent carbon, 13 per cent chromium, 2 per cent cobalt and 1 per cent molybdenum would work as well as aluminum bronze under friction. Under one condition in his experience, cast iron had worn .017″ to .035″ while aluminum bronze had worn only from 0″ to .02″. It was also effective for valve guides.

Mr. Bregman asked if there was any comparative data on sand-cast aluminum bronze as against that metal cast in permanent molds. Mr. Jones answered that the permanent mold castings were superior, but that aluminum bronze could be sand cast quite easily, in his opinion, more easily than manganese bronze.

SESSION NO. 8—A. F. A.—SAND RESEARCH

WEDNESDAY, OCTOBER 15, 9:30 A. M.

PLANKINTON HALL, AUDITORIUM

W. M. SAUNDERS, CHAIRMAN

R. J. DOTY, ASSOCIATE CHAIRMAN

The Physical Properties of Foundry Sands

BY C. A. HANSEN, GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

This paper discusses the data of an investigation carried on in an endeavor to correlate most of the measurable properties of a few simple foundry sands, on the principle that a fairly intimate knowledge of a few sands is more useful than a heterogeneous mess of isolated data covering a great many sands. The following properties were studied: green bond (Doty Test), green compression strength, dry cross-bending and dry compression strength, green and dry permeabilities and green and dry densities. The author concludes after reviewing the test results that: (1) green strength is primarily a surface tension affair. Numerically it is a measure of the amount of increased water surface created by the displacement of the sand grains during rupture of a core. It is often confused with viscosity, as in the case where various organic binders are added to core sands to give them apparent strength. Green strength may determine molding characteristics, but rather in the way that high green strength involves sand that will not flow laterally beneath a rammer and thus leads to non-uniformity rammed molds and scabbed castings. It has no bearing upon the capacity of the mold to withstand the action of molten metal. (2) Dry strength determines the capacity of a mold to withstand molten metal. This is true of green sand molds as it is of dry sand molds.

A New Method of Measuring the Hardness of Molds

BY E. RONCERAY, PARIS, FRANCE

A description of the new mold hardness tester developed by the author which was exhibited at the first International Foundry Exhibition in Paris, France, in September, 1923. The device is not yet completely perfected, and the paper was, therefore, rather sketchy. It is based, in general, on the principle of the Brinell tester. A ball is pressed into the mold and the depression measured.

Molding Sand Reclamation and Control Experiments

F. L. WOLF AND A. A. GRUBB, OHIO BRASS COMPANY, MANSFIELD, OHIO

Brass foundry refuse sand is reclaimed by adding small percentages of a very high bond sand. High freight rates have been eliminated by the use of local sands under careful control. Tests show that mulling increases the bond of heap sand, refuse, reclaimed mixtures and new sand mixtures from 30 to 90 per cent. It also closes the sand, but it can again be opened up without material sacrifice of bond by screening or a similar process. This treatment puts sand in excellent condition for molding. The effect of mulling on other characteristics of sand and the relation of these characteristics to bond strength and working qualities are discussed. New and rapid methods for measuring moisture content and tensile bond are described. Reclamation and control methods have been important factors in producing low foundry costs. Both foundry losses and molding sand costs have been reduced more than 50 per cent during the past year.

New Ironless Yacht

According to a report from the Department of Commerce, the hydrographic department of the Esthonian General Staff has chartered an ironless yacht and has commissioned Commander Gernet, the owner of the yacht, to conduct a magnetic survey of the Gulf of Finland and of the Esthonian waters of the Baltic Sea.

The yacht is 14.15 meters long, with a beam of 3.80 meters and 1.55 meters draught. The gross tonnage is 20.18 registered tons. The yacht is made and equipped completely of non-ferrous materials and no articles made of iron or steel are admitted on board. The yacht is rigged as a ketch and has no motor. The surveying equipment consists of the following instruments: one double compass, system of Dr. Bidling-Meyer, for the measurement of the horizontal component; for the measurement of the vertical component—one dipping needle and vertical deflector, system of Major-General Clapier de Colongue, Russian Navy; for the measurement of the declination—one fluid compass with shadow pen and diopter, system Plath, Hamburg. The crew of the yacht consists of a captain, who is also the scientific chief of the expedition, two assistant scientists, four sailors and one cook, in all eight persons.

Commander Gernet was formerly in the Russian Navy and is a graduate of the hydrographic department of the Russian naval school. The present project is reported to be making satisfactory progress, but the results of the expedition have not yet been made available.

This vessel resembles in its materials of construction the Carnegie, an ironless vessel (which was described in THE METAL INDUSTRY for January, 1909). The Carnegie was built to make magnetic surveys, and was much larger than the Esthonian, being 155 feet 6 inches long and having a displacement of 568 tons.

Reclaiming Brass Foundry Sands

Molding Sand Reclamation and Control Experiments*

F. L. WOLF[1] and A. A. GRUBB[2], Mansfield, Ohio

Late in 1922 The Ohio Brass Company started experiments with a view to reclaiming waste sands which were passing from their brass foundry to the dump. An account of the preliminary work and first practical trials were given in a report entitled "Brass Molding Sand Reclamation and Conservation Experiments,"[3] at the Cleveland Convention of this Association in 1923. Two molding floors were operated entirely on reclaimed sand during the following summer, and, with other floors operated on new sands, were carefully observed. An account of these trials and observations was reported[4] to the committee in October, 1923. The present paper deals with further experiments along this line, the extension of reclamation work and sand control methods to our entire brass foundry and the effect on molding losses.

RECLAMATIONS EXPERIMENTS

The refuse sand which we have been reclaiming consists of the fine material from foundry floor sweepings. The cores, core wires, scrap brass and spillings are hand picked and screened out with aid of an eight mesh screen. About 260 pounds of this fine material are produced each week by each floor. It has a bond value of about 135, a figure entirely too low for molding purposes.

In our first experiments at reclaiming this sand, it was mixed with fine medium bond sand from Northern Ohio. This served to build up its bond, but also tightened the sand. The grain size was too small. A high bond, but larger grained material was needed. The Gallia County (Ohio) red sands offered possibilities so were tried out experimentally. Table 1 lists data on several sands used successfully in the experiments. The figures are average values. The local No. 1 and No. 2 sands are produced in Northern Ohio and were used as substitutes for the No. 1 and No. 2 Albany sands because of lower freight rates. The class of work made in our foundry requires a bond value between 150 and 180 grams and permeability between 17 and 25 depending on the job. The grain size of the local No. 2 and the Gallia sands appealed to us because they tended to keep the heaps open.

TABLE NO. 1

	Heap Sand.	Refuse Sand.	Albany No. 1	Albany No. 2	Local No. 1	Local No. 2	Gallia.
Permeability	20	23	20	40	19	45	103
Bond	160	135	170	155	165	153	355
Tensile strength	128	92	150	125	140	120	751
Fineness of grain ...	134	125	150	105	178	87	86
Clay (A. F. A.)	7	6	8	7	8	9	27
Clay (vibratory) ...	25	20	18	14	21	9	74
Dye absorption	130	110	160	160	220	260	1700

A number of combinations were made up and examined. Gallia sand was mixed with the refuse to renew its bond. The local No. 1 sand was added to reduce grain size and tighten the sand for smooth surfaces, while the No. 2 sand was used when greater permeability was required. The mixtures were tried out on experimental molding floors under close observation. The quality of lift and the number of stickers, drops, etc., were noted and casting losses due to dirt and misruns were observed. The mixtures and rebuilds best suited to the requirements of the work were thus studied.

Intimate mixtures were made by passing the sand several times through coarse riddles or through a Royer machine. This latter is a motor driven cleaning and mixing device. Its action is similar to that of a riddle. It has no rubbing or mulling effect. Neither the screens nor the Royer developed the bond in the sand even when the operations were repeated several times. Th rolling and rubbing action of a muller was required to bring out the strength. A small No. 0 muller was supplied by the National Engineering Company of Chicago for use in these tests and has proven very valuable.

Data from these experiments are given in Table 2 and the chart Fig. 1. Various sands and combinations of sands were mixed thoroughly with the Royer (marked R in the table) or screened (marked S) and then sampled. They were then mulled for various periods and samples were taken after each period.

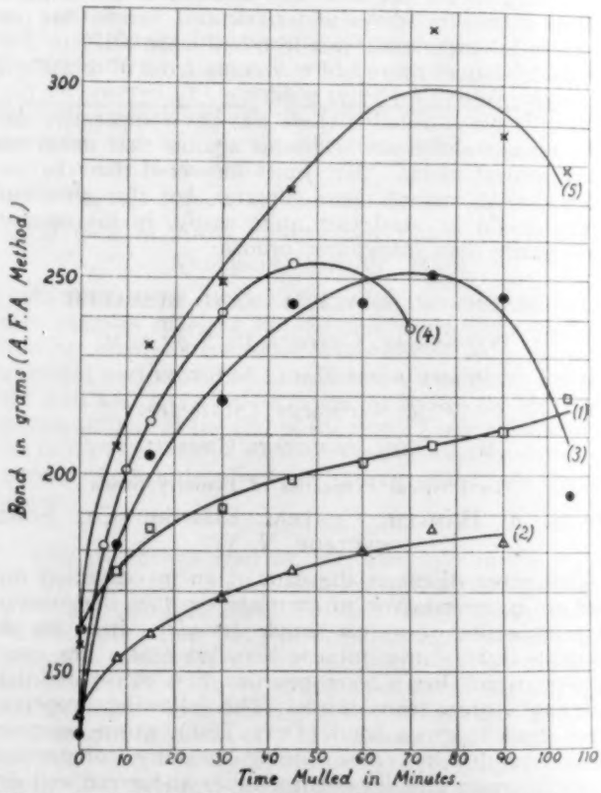

FIG. 1. CURVES SHOWING EFFECT OF MULLING ON BOND OF VARIOUS SANDS AND SAND MIXTURES. NUMBERS REFER TO TABLE 2

Maximum bond was obtained only after from 50 to 75 minutes in the machine. These long periods may have been due to the small size of the muller, but nevertheless, they indicate that a very considerable amount of work is required to properly distribute the bonding material on the sand grains. Mulling for as short periods as eight or ten minutes tightened up nearly all the samples as shown at the foot of the table; continued mulling made but little further change. No. 8 was the one exception; its permeability increased from 30 to 40 and then dropped to 23. Several samples were put through the Royer after the mulling process. This served to open them up six or eight per cent at a very small sacrifice in bond.

*A Paper presented before the American Foundrymen's Association Convention in Milwaukee, Wis., Oct. 11-16, 1924.
[1]Technical Superintendent, The Ohio Brass Company.
[2]Director of Laboratories, The Ohio Brass Company.
[3]Transactions A. F. A., Vol. 31, pp. 649-655.
[4]Bulletin A. F. A., Vol. 3, January, 1924, pp. 19-21.

TABLE NO. 2

Mixture numbers	1	2	3	4	5	6	7	8	9
Per cent heap sand in mixtures	100								
Per cent refuse in mixtures		100	60	60		88	85	80	95
Per cent Local No. 1 in mixtures			30						
Per cent Local No. 2 in mixtures				30	90				
Per cent gallia in mixtures			10	10	10	12	10	10	
Per cent Albany No. 2½ in mixtures							5	10	
Per cent Albany slip in mixtures									5
Method of mixing	S*	S	R**	R	R	R	S	R	S
Bond of mixture	160	139	134	139	156	133	144	133	138
Perm. of mixture	20	28	23	26	45	25	20	30	19
Bond after mulling 10 min.	178	155	190	198	212	169	158	143	178
Perm. after mulling 10 min.	19	23	19	21	43	19	19	37	16

*Screen method.
**Royer method.

Mulling alone without addition of new bonding material, served to restore considerable bond strength to refuse sand, curve (2) of Fig. 1. This sand gave satisfactory service in making small brass castings for a few heats, but

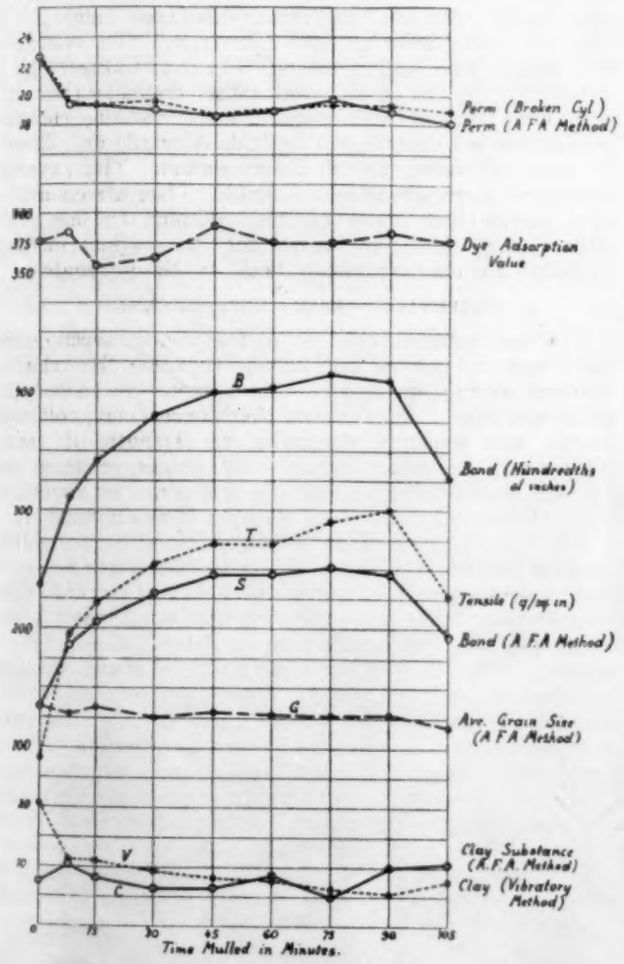

FIG. 2. EFFECT OF MULLING ON THE PHYSICAL CHARACTERISTICS OF SAND MIXTURE NO. 3, COMPOSED OF 30 PER CENT LOCAL NO. 1, 60 PER CENT REFUSE AND 10 PER CENT GALLIA SANDS

deteriorated rapidly. Ordinary heap sand, curve (1) Fig. 1, with a bond of 160 was mulled to a value of 203 in an hour. Its working properties were greatly improved and the effect of molding losses was clearly evident for several days.

Sand mixtures Nos. 3 and 4 (Table 2) were found very satisfactory for rebuilding molding heaps. One or two wheelbarrow loads were added each week; No. 3 if the heap sand was sufficiently open, No. 4 if too tight. If weak in bond and yet tight, more No. 2 sand was used. These mixtures and similar ones containing different proportions of refuse, Gallia and the two local sands have been in regular use, in our foundry, replacing the more expensive Eastern sands with marked success during the past year.

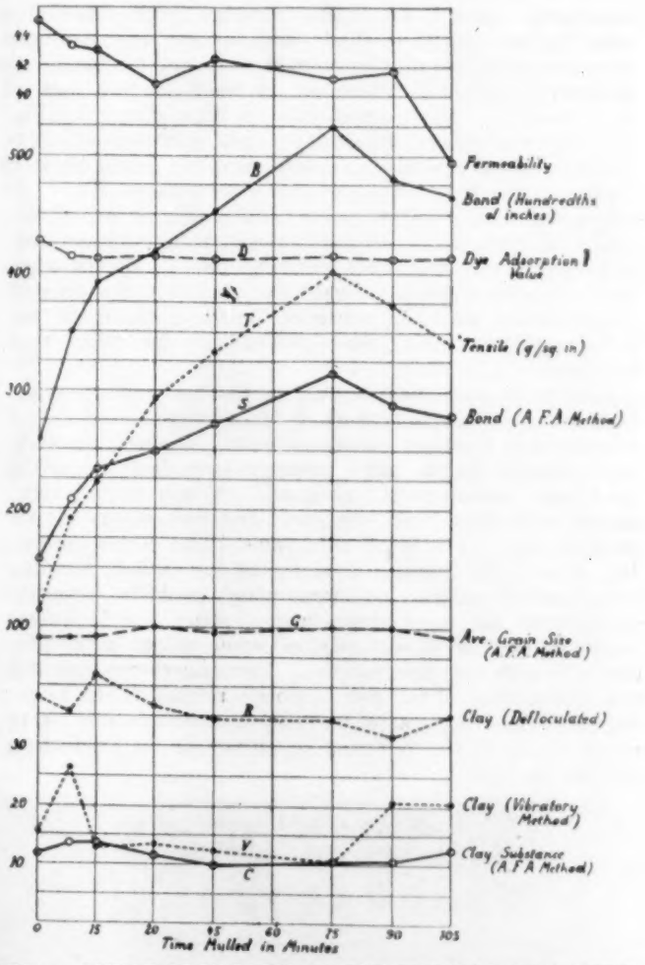

FIG. 3. EFFECT OF MULLING ON THE PHYSICAL CHARACTERISTICS OF NEW SAND MIXTURE NO. 5, COMPOSED OF 90 PER CENT LOCAL NO. 2 AND 10 PER CENT GALLIA SANDS

The long period of mulling necessary to develop maximum bond operated against the practicability of the method. Attempts were therefore made to use the mixtures without mulling. They were put through the Royer machine and then introduced into the heaps or else introduced as the entire sand heap was put through the machine. When added in small quantities at frequent intervals, the bond value of the heaps was maintained fairly well so long as they were not used too severely. In fact, fairly good results were obtained for several weeks. The handling of the sand seemed to develop some of the bond —and fast enough to offset that burned out. It developed, however, that mixtures which were mulled maintained and even built up the bond value of the heaps much better. In fact, best and quickest results were obtained on badly burned out floors by putting the entire sand heap through the muller, adding the rebond and refuse sand in the process. It was impractical to leave the batches in the muller long enough to develop maximum bond, but five

to ten minutes has given good results. Doubtless a longer time would be better.

EFFECT OF MULLING ON OTHER CHARACTERISTICS

In order to further study the effect of mulling on the physical characteristics and working properties of sand and also to study the relation of certain proposed methods of test to working properties, several of the sands and sand mixtures of Table No. 2 were examined further. The samples were tested according to the standard A. F. A. methods for permeability, bond, fineness and dye absorption value. The same samples were tested for bond by two rapid methods with which we have been experimenting for routine control work and by the Smith vibratory method.[5] The data obtained in two sets of these tests are shown graphically in Figs. 2 and 3. Fig. 2 charts the values obtained on sand mixture No. 3 of Table 2, 60 parts refuse, 30 parts local No. 1 and 10 parts Gallia sand. Fig. 3 shows results on mixture No. 5, 90 parts local No. 2 and 10 parts Gallia. Fig. 4 is a photograph of one of three sets of vibratory tests made on mixture No. 3 and the sands entering into its composition. So far as the relation between the various characteristics is concerned, the data recorded in these charts do not differ materially from that obtained on the other sand mixtures.

Line S on each chart represents the bond values as determined by the standard A. F. A. method. The No. 3 mixture was tried out on two molding jobs without mulling. Losses due to dirty castings were heavy and the sand was pronounced "no good." When mixed thoroughly with good heap sand, half and half, it gave fairly good results. The bond value was 152. After mulling No. 3 for eight minutes it was used for difficult molding with marked success; no losses which could be definitely ascribed to the sand were made. After a still longer period of mulling it was used on some of our most difficult jobs with excellent success. Our experience indicates that the standard bond test is closely related to the working properties of the sand and that it measures a property which is one of the determining factors in the production of dirty castings.

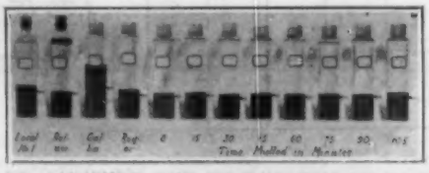

FIG. 4. VIBRATORY TEST ON LOCAL NO. 1, REFUSE AND GALLIA SANDS AND MIXTURE NO. 3, COMPOSED OF 30 PER CENT LOCAL NO. 1, 60 PER CENT REFUSE AND 10 PER CENT GALLIA SANDS

Line B represents bond values measured by one of the rapid methods. Test specimens 1 inch x 1 inch x 12 inches in size are rammed up by hand, using only a two part core box and a core maker's mallet and trowel. These are pushed slowly over the edge of a plate or table and the average length of the broken pieces is taken as a measure of bond. This method is very rapid and has been successfully used for core sand control work in our foundry during the past four years and for molding sand work until recently when we replaced it with the tensile method described below.

Line T represents values obtained by another rapid method which promises to be of value for routine check and control purposes. The same specimen is used for both the permeability and the bond tests. The sand cylinder shown at (A), Fig. 5, consists of two parts which are firmly clamped together while the specimen is prepared and tested for permeability. The clamps are then removed and the cylinder is pulled apart with the aid of a tension device built on the rammer stand. The sand specimen is broken at its mid point. The spring balance (B) is calibrated to register the tensile strength per square inch.

It is evident that the three methods of test for bond or strength are very closely related. The tensile test shows greater difference in the relative strength of two given samples than do either of the other tests. The permeability determinations made with a two part cylinder are sufficiently accurate for practical purposes even after the parts have suffered wear from several hundred determinations.

Line G in the charts represents the average grain size, that is, the mesh of the screen through which the average grain would just pass after the clay substance, represented by the line C, has been removed by the standard A. F. A. method.[6] Line D shows the dye adsorption values of the samples. In all the tests the grain size and clay content as well as the dye adsorption value remained practically constant throughout the entire period of mulling.

The Smith vibratory test, line V and Fig. 4, gave results which in some cases were comparable with the clay substance obtained by the A. F. A. screen method; in other cases, heap sand and refuse sand (see Table 1), for instance, there were marked differences. The vibratory test usually gave higher values. On sand mixtures No. 5 (chart Fig. 3) the results were rather erratic, so the samples were treated with dilute caustic solution, shaken, neutralized with acetic acid and then vibrated and allowed to settle according to the Smith method. The average results are represented by the line R. They are considerably higher than those obtained without the use of a defloculating agent, indicating that the original method probably does not completely break up the aggregates.

POTENTIAL VERSUS SENSIBLE BOND

The data collected thus far by the various investigators point only to general conclusions regarding the relation between average grain size, clay content, dye adsorption value and bond. It is evident that fineness, clay, colloidal matter and moisture determine the strength of sand. There may be other factors. No definite relation has yet been established; the field is a fertile one for investigation. Permit us to offer one thought in this connection.

The fact that by mulling samples of sand we are able to develop greater bond while the other characteristics mentioned above remain constant, indicates that possibly these characteristics determine the *potential* bond, that is, the maximum strength which can be developed in a given sample. The *sensible* bond, that is, the actual strength existing at any given time, is determined by the distribution of the particles as well as their size, quantity and composition and is measurable only by strength tests of some kind. If this is a fact, and there is abundant evidence that it is, then in producing sand or in purchasing it we are interested primarily in the factors which determine potential bond, namely, fineness, clay, dye adsorption value and perhaps others. On the other hand, in using it on the molding floor we are interested mainly in the sensible bond—the bond strength actually present.

MOLDING SAND CONTROL

The successful use of reclaimed sand depends a great deal on knowledge of the sand heaps into which it is introduced and of the work being made in them. Our reclamation work has been done in close conjunction with control work. In fact, control methods were extended to the foundry floors several weeks before attempting to use reclaimed sand in any great quantity. So any success

[5] E. W. Smith, A Physical Test for Foundry Sands, Transactions A. F. A., Vol. 31, pp. 623-630.

[6] Tentatively Adopted Methods of Tests of the Joint Committee on Molding Sand Research, American Foundrymen's Association, June, 1924, pp. 54, 55.

we have had with reclaimed sand was due in part at least to the control methods.

One man devotes full time to sand control and reclamation work. He is held responsible for the condition of the sand heaps in our brass foundry and makes all additions of sand. Additions are determined by the size of the heap, the bond and permeability of the sand and the type of job being molded, so the man has a real life size job. He works in close conjunction with the floor bosses, or instructors, as they are called, each of whom have charge of several molding floors.

In order to facilitate this man's work we have placed specially constructed test apparatus in a room adjacent to the foundry. Each sand heap is tested for bond and permeability and appropriate additions are made at least once a week, sometimes two or three times, depending on the individual jobs. Heavily cored jobs frequently require daily attention.

The test apparatus consists of the standard A. F. A. permeability testing outfit fitted with a direct reading scale for use with the standard orifices, the tensile bond measuring device described above and a moisture measuring apparatus. This equipment is shown in Fig. 5.

The moisture determination apparatus consists of four electric heating chambers arranged to pass dry air at about 400 degrees Fahr. through as many samples of sand contained in small aluminum capsules; also an automatic weighing device equipped with a chart that indicates the percentage moisture without calculation. With this outfit we are able to make from 30 to 40 determinations per hour; a single test in from five to eight minutes.

FOUNDRY LOSSES

A very important factor in our foundry control work is the system for determining and recording losses. Each molder's castings are kept separate until they have been cut from the gates, cleaned and inspected. Molding losses due to dirt and shifts are charged against the molder's piece rate wage. The instructors may earn a weekly bonus by making low losses. The daily loss of each molder is reported back to the instructor and charts showing the loss of the group under each instructor are posted.

The results of a year of control work, the last ten months of which recovered sand was used in considerable quantities on all our brass molding floors, have been very gratifying. The reclamation work alone has made no great saving because our consumption of sand is not large. It has, however, covered the expense involved in reclamation and control work, giving us the benefits in the way of reduced losses as clear gain.

During the years 1922 and 1923 the cost of the new molding sand used in our brass foundry was slightly over $1.00 for each ton of good castings produced. This was due to the fact that we were using only high grade Eastern sands and paying high freight rates. During the past six months this item has averaged only $0.46 per ton of castings, a reduction of 54 per cent.

The reduction in foundry losses during the past year has been worth much more than the saving in sand. During 1922 our brass foundry loss was 8.5 per cent. It averaged 9 per cent for the first three-quarters of 1923. Since that period there has been a marked reduction, the average loss for the past five months being a little less than 4 per cent. Dirty castings were reduced 60 per cent and blows and mis-runs 55 per cent. This means a saving of some two or three thousand dollars per month.

This saving is, of course, not due to molding sand alone. We would certainly not ascribe it to the use of recovered refuse sand. The personal factor is such an important element in molding that due credit must be given to the molders and their instructors. The system of recording losses and placing responsibility for them has been a big factor. Greater care in handling the metal and changes in gating have had important bearing. The sand control work, however, which has been carried along with the reclamation work, has been a most important factor in two respects: First, it has helped to keep the sand heaps in good condition and so permit the molder to get better results; and, second, it is giving definite knowledge about the condition of the sand so that no longer is the sand "the goat" for every trouble the molder may have, the cause of which is not readily apparent.

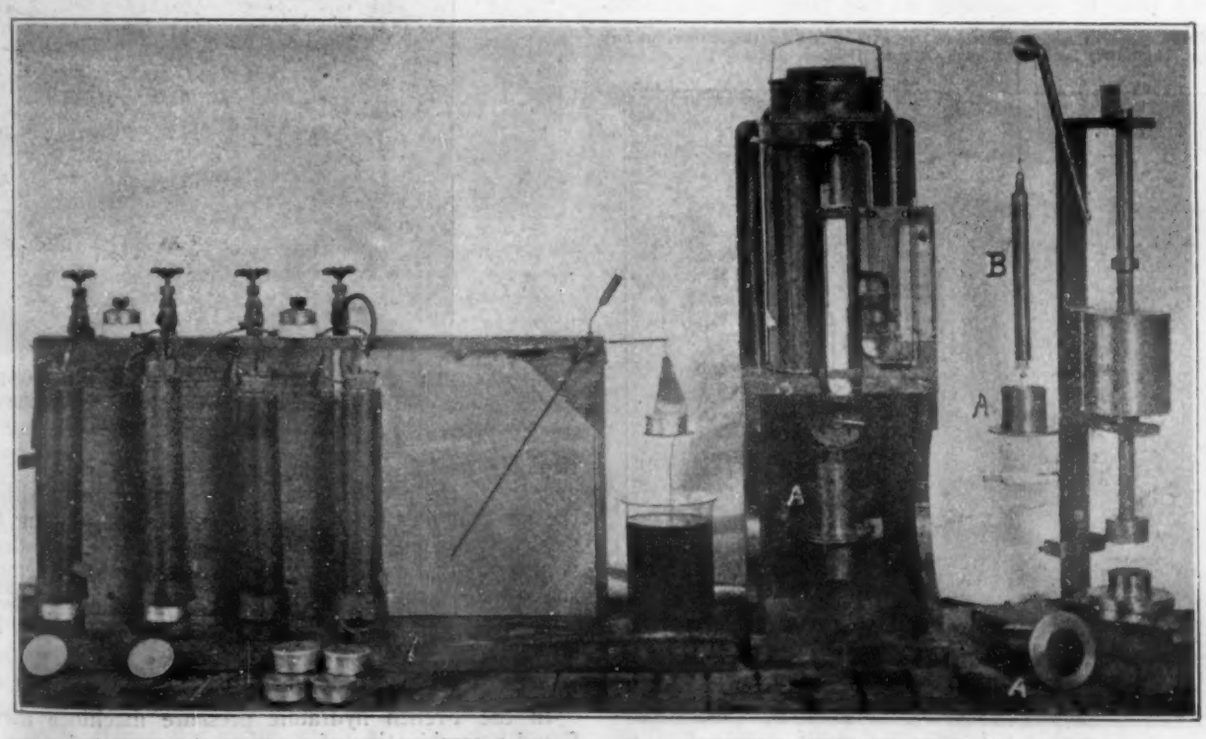

FIG. 5. MOISTURE (LEFT), PERMEABILITY AND TENSILE BOND TESTING APPARATUS FOR SAND CONTROL WORK

Types of Molding Machines

A Number of Representative Machines Made in the United States and Abroad Described and Analyzed*

Written for The Metal Industry by R. E. SEARCH, Exchange Editor

A MAMMOTH JOLT MACHINE

In Figure 5 (Photo EE-1507 furnished to the writer, especially for this article, by the courtesy of the Osborn Manufacturing Company of Cleveland, Ohio), the reader is shown one of their newest types and largest size of their plain jolt machine.

In the following description, A represents the air intake line; B, the specially designed Osborn Jolt valve; C, the upper nut for adjusting the length of the stroke; D, the lower adjusting nut for regulating the amount of the compression under the piston. By building up a pressure greater than the line pressure the piston strikes bottom and then continues rapidly up without *rebounding* or tetering. E, the muffler or air exhaust. F, the oil intake line, oil is forced through this line by full air pressure whenever desired by the operator. G, the pet-cock on jolt-valve for securing piston circulation of oil. H-J, pet-cock on jolt cylinder for securing piston circulation of oil. K, safety limit pin to prevent possibility of jolt piston blowing out of cylinder.

The Osborn plain jolting machines are built with a capacity of from 200 pounds upwards to approximately eight tons.

Ordinary pattern equipment such as is used on the foundry floor is all that is required on molds where the quantity is not great enough to warrant the use of machines and equipment for ramming, rolling and drawing combined. The plain jolt frequently saves much time by performing all the ramming by jolting.

*Other types of molding machines were described by the author in THE METAL INDUSTRY, for August and October, 1924.

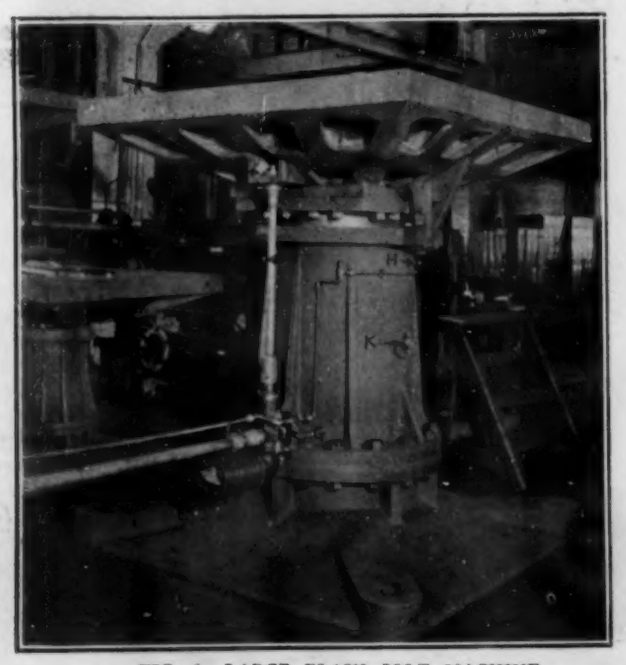

FIG. 5. LARGE PLAIN JOLT MACHINE

Among the castings turned out by this type of machine are engine cylinders and bases, large gas engine flywheels, and, in fact, almost any kind of large molds can be handled to good advantage.

Figure 6 shows a picture of a number of molds put up of shallow work with a large amount of draft.

It is believed by some experts that jar-jamming is particularly useful for ramming up deep work as it does away with the necessity of any hand ramming. Although the jar-ramming machine is so useful in a jobbing foundry for ramming light work having considerable draft it is also of great value for work of a general character, not shallow all through. With a little careful planning such a machine can be kept in almost continuous active operation.

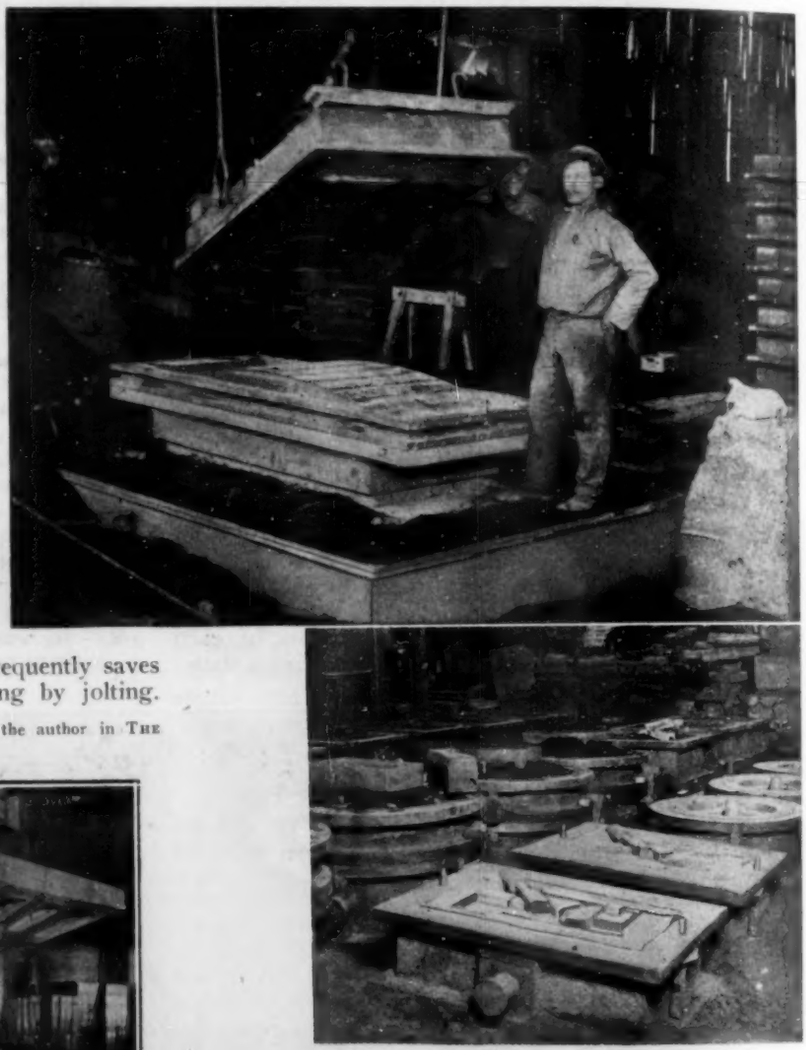

FIG. 6. AN OSBORN PLAIN JOLTING MACHINE'S WORK WITH SHALLOW PATTERNS HAVING A LARGE AMOUNT OF DRAFT

HYDRAULIC PRESSURE MACHINES

In the French hydraulic pressure machines there is found a combination of a power pressure and a squeezer

machine; it runs both top and bottom parts of the mold at the same time. The pattern frame in this instance is fixed to a swinging arm on a column, the pattern being arranged on the top and bottom of the pattern-plate. This is placed in the frame and is brought between the pressure heads and the bottom table when required. Behind the swing arm, attached to the column of the machine are arranged the operating valves.

Operation. The mode of operating is to set the drag on the lifting table, filll it with sand about one and one-half inches above the level of the flask, then bring the swinging arm into position with the pattern placed over it, then set the cope on the pattern plate, and fill it with sand one and one-half inches above the top of the flask. The operation of the valves raises the drag to the pattern and lowers the top pressure head to the cope at the same time. The pressure is kept on long enough to squeeze the whole bulk of the sand to the level of each flask. The cope is then attached to the top head. The operating valves on being reversed raise the top head with the flask attached, and the bottom table with the drag lowers. The pattern is then swung clear, and the valves being put into action against the flasks, come together on their flask pins. The top attachment is then released, the flasks clamped together and removed to the pouring floor.

In the French machines the plunger is stopped in its upward movement after it has compressed the sand over the stools enough and then withdraw the stop. The accompanying Figure 7 illustrates a French jolting machine operated by hydraulic pressure, for molding sinks; the cope and core are squeezed at the same time. It is made by Emile Monnat of 10 Rue N. D. de Lorette, Paris.

It is claimed for the molding machines operated by

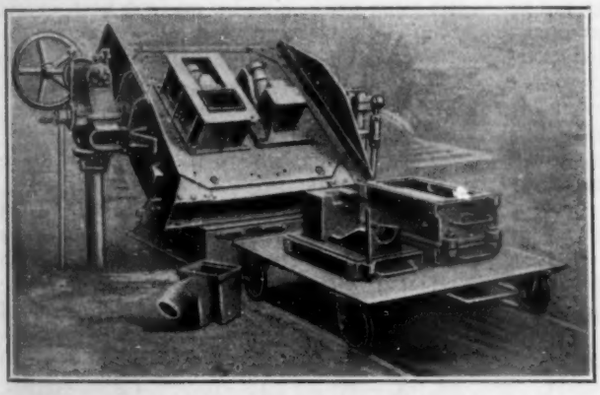

FIG. 7. FRENCH JOLTING MACHINE

hydraulic pressure that by the enormous pressure available it can compel the sand to flow up along the sides and around a pattern much better than any other type of machine, and that sand can be used in a much drier state than in a machine operated by compressed air, in other words, the sand will flow around the pattern and soft spots will be avoided. But this basic claim is only partially true. No matter what the pressure is sand will flow in a direction directly parallel to the lines of force exerted upon it, because sand no matter how dry it is, in no instance will be as mobile as a liquid, and the law of pressures for liquids does not hold true for sand; furthermore, there is so much frictional resistance between the adjacent particles of sand, that more or less of the force exerted is absorbed by this frictional resistance. The French machine works almost wholly upon the squeezer principle.

The firm of Bonvillain and Ronceray of Paris has made hydraulic machines for many years, and, of course, the hydraulic power, while well adapted to squeezing is but poorly adapted to jolt-ramming. At the same time pneumatic machines were developed in this country and the development for large molds proved to be along jolt-ramming lines rather than squeezing. About four years ago, American air operated jolt-ramming machines began to push the Bonvillain and Ronceray machines in France to the wall, and since that time, Mr. Ronceray has done considerable writing in attempt to prove that jolt-ramming is suitable for hardly any class of work, whereas squeeze-ramming is much to be preferred.

Competition has now become so keen, that Bonvillain and Ronceray have been forced to put on the market a jolt-ramming machine in direct contradiction to their oft-repeated views on their theory of jolt-ramming. Up to the present time no details are available as to the construction or operation of their jolt-machines.

SUITABILITY OF MOLDING MACHINES

So highly specialized has machine molding become that now, in undertaking any extensive repetition job it is the part of business prudence for any founder to call a conference of the best known molding machine manufacturers to meet their own engineers and put the problem in hand squarely up to them.

Someone has suggested that a committee of expert molding machine engineers and designers be appointed by the American Foundrymen's Association to act as advisers to any firm who may have need of their advice. It is worthy of thoughtful consideration and action.

Wherever molding machines are installed increase in output ensues. While the result varies considerably, nevertheless it is fair to assume that machine production, at the minimum, will double the product obtainable on the floor or bench by hand molding methods, and it is not unusual to increase the number of mold put up per day by five and six-fold. To a large extent, this will depend upon the class of work, the facilities given to the machine operators to get their sand and special facilities for certain work. The successful working of molding machines depends largely on the enthusiasm displayed by the foreman, molder and pattern-maker.

Competition in business where large contracts are at stake will do more than any other one factor in making a steady market for molding machines, and will also be a vital force in their further advancement and development.

Drawing Rectangular Shapes

Q.—Please give me some information on rectangular drawing operations on aluminum, with or without tapes, involving more than one draw.

A.—When square or rectangular shapes are to be drawn the radius of the corners should be as large as possible because it is the corners where defects occur when drawing. Moreover, the smaller the radius, the less the depth which can be obtained with the first draw. The maximum depths which can be drawn with corners of given radii are as follows:

Radius of 3/32″ to 3/16″, depth of draw 1″
Radius of 3/16″ to ⅜″, depth 1½″
Radius of ⅜″ to ½″, depth 2″
Radius of ½″ to ¾″, depth 3″

If the box is to be quite deep and the radius is small, two or more drawing operations will be necessary. For drawing deep work on aluminum, lard oil is the best lubricant to use. Aluminum should never be worked without a lubricant. Vaseline of a cheap grade can be used.—P. W. BLAIR.

Cupola Castings

Making Copper Castings from Cupola Melted Metal*

By T. F. JENNINGS, Garfield, Utah

The casting of copper in sand molds has always been attended with considerable difficulty because of the fact that copper, like most elementary metals, absorbs gases while it is being melted. These gases being retained after the metal becomes solid produce a structure resembling a sponge, and the defect for that reason is known as sponginess. This difficulty, being productive of unsatisfactory results, has created a certain prejudice against the use of the metal in the minds of some foundrymen, which is entirely unjustified. There is no reason why copper castings cannot be produced just as easily and readily as castings of iron, or any other metal, if certain fundamental facts, peculiar to the metal while in the molten state, are observed. For acid-resisting purposes it is the opinion of the writer, that approximately 50 per cent of the castings made in iron, should be made of copper. It is tougher than iron, and can be made quite hard.

COMMON CAUSES OF DEFECTS IN COPPER CASTINGS

Sponginess, blowholes, porous or unsound castings are the usual causes of rejections in the case of copper castings. Occasionally, castings of this character can be used; but as a general rule they are unfit for practical use, and if their true character is not discovered before they are placed in service, they are liable to cause trouble, expensive delays, and perhaps serious accident.

Pores or blowholes in castings, sometimes are caused by wet or hard-rammed molds, or cores. The principal cause, however, lies in the metal itself, for it is a peculiar fact, that copper, like a number of other elementary metals, and some alloys also, melting above 1,000 degrees Cent., when cast in sand molds will produce gaseous castings. This condition will occur, no matter how carefully they may be melted, and handled, unless some metal or flux is added to the melt to "deoxidize it," as it is termed.

NEED FOR DEOXIDIZERS

The substance with which the copper is treated is generally known as a "deoxidizer," that is, an oxygen remover, which would lead to the supposition that oxygen was the gas responsible for the porous condition of the metal. There appears reason to believe, though, that sulphur has an important part in the production of the gas, as sulphur and oxygen react and form the gas, sulphur dioxide, which if generated within the molten metal might be retained and so produce this condition of porosity.

While it is not the intention of the author of this paper to enter into a discussion concerning identity of the gases responsible for the unsoundness of the castings as it is a subject he has not taken the time to study; it will be evident that it is advisable whenever copper is being melted for castings, that it be protected as much as possible from contamination by both sulphur and oxygen.

FURNACE FACTORS

Accordingly many foundrymen prefer to melt their copper in crucibles, as it is comparatively quite easy to protect it with a covering of charcoal, or of some suitable flux, especially when natural-draft melting furnaces using solid fuel, are the melting medium. In the case of oil or gas-fired furnaces even with crucibles it is less easy to protect the metal from the gases, as the force of the flame blows away the charcoal covering, making it necessary to use something on the order of a flux that will melt and cover the surface of the metal, and which will not be displaced by the force of the blast. When melting with non-crucible furnaces consuming oil or gaseous fuels, it is more difficult to protect the copper than it is in the case of the crucible furnaces, as there is intimate contact between the flame and the metal. Electric furnaces should theoretically be excellent melting mediums for copper, as the furnace can be worked closed, or open as thought best. The cupola furnace, as used for cast iron, has the reputation of being the most unsatisfactory melting medium that can be used for copper, and most non-ferrous alloys, as the metal, fuel and air blast are in intimate contact during the entire melting period. Many foundrymen are of the opinion that this furnace cannot be used for melting such metals and alloys.

THE USE OF THE CUPOLA IN MELTING COPPER

As the author has had considerable experience in making light and also heavy copper castings from cupola-melted metal, it may be of interest to give an outline of the methods used, as some of the copper castings made from the cupola have weighed up to five thousand pounds, with walls from three to seven inches in thickness, and about forty per cent were finished all over on the outside.

CUPOLA PREPARATION

The cupola used was a No. 3, Whiting cupola, which was put up in the same manner as for an iron heat, except that care was taken to have the wood used to start the fire on the bottom, free of all iron, in the shape of nails. This is a precaution that should always be taken when non-ferrous metals are to be melted. It is, of course, unnecessary in the case of iron melting, but important for copper, and is mentioned at length because it is one of those little things, necessary for success, so easily overlooked. In order to protect the copper as much as possible from the sulphur in the coke, it was sandwiched between layers of charcoal; thus instead of charging copper directly on top of the coke bed, the charges were made as follows: The bed charge consisted of 600 pounds coke, charcoal 45 pounds, and copper 1,250 pounds. The charges following the bed consisted of charcoal 45 pounds, coke 60 pounds, charcoal 45 pounds, and copper 1,250 pounds. The entire amount of copper for each heat was thus protected by layers of charcoal from the sulphur contained in the coke. A mild blast was employed, eight ounces, and the slag hole was not opened during any of the heats which ran about 15,000 pounds each.

CALCIUM CHLORIDE USED AS A FLUID SLAG

We used a high per cent of copper wire in the charges and ran the heats 15,000 pounds, in from one hour to one hour and fifteen minutes. After the copper was melted it was tapped into a ladle of suitable size, which had been previously heated with an ordinary ladle torch heater, for about one-half hour. About ten minutes before the metal was tapped into the ladle about one-half of one per cent of calcium chloride was placed in the bottom, which when the copper is tapped onto it makes an absolutely air-tight covering.

PRECAUTIONS WHEN USING CALCIUM CHLORIDE

This chemical, however, must be used with caution as it contains water, as water of crystallization, and in addition it absorbs water from the atmosphere when exposed there-

*A Paper presented at the Joint Meeting of the American Foundrymen's Association and the Institute of Metals Division in Milwaukee, Wis., October 11-16 1924.

to, which would cause an explosion if the chloride was submerged in the copper, as it would be if dropped into it. By adding it in the bottom of the heated ladle the water is driven off and there is no danger of metal flying. In addition to the calcium chloride, a generous layer of charcoal is placed in the ladle immediately before the furnace is tapped. A few handfuls of silica sand was thrown in the lips and stirred in well to stiffen the slag.

PHOSPHOR COPPER AS A DEOXIDIZER

The deoxidizer used was one per cent of phosphor copper, containing fifteen per cent phosphorus, and this is the way we used it: We handled the metal in 5,000 pound ladles and drew the metal in three taps; after the first tap we added the phosphor copper, the slag cover stuck close to the sides of the ladle and kept it from evaporating and the two following taps mixed it well without stirring or poling. To avoid the fumes and smoke and have prompt crane service, we brought the metal down after the whistle blew, and carried the metal from cupola to molds in about one minute and poured it at about 1,950 degrees Fahr.

POURING PRECAUTIONS

In pouring the castings the rate of pouring was diminished just before the mold was filled. Whenever heavy risers had to be put on, a small piece of phosphor copper was always dropped into each one and the riser was churned until it set; the hot metal to supply the shrinkage during the churning being obtained from a Hawley Schwartz small furnace, run especially for the purpose.

SAND AND MOLDS

An open facing was used composed of half red sand and half sharp sand and one to twenty (1 to 20) of core compound. We did not use seacoal or coke dust on account of gas and sulphur. In ramming the molds the rammer was always kept about one inch away from the pattern, and the molds were very thoroughly and carefully vented.

In making heavy castings of copper, the practice has always been to dry the molds, and to pour them from the bottom, using cores to carry the metal down and into the mold cavity.

HARDENING COPPER

When the copper castings are to be used for "acid-resisting" purposes, or where hard wearing qualities were demanded, it has been our custom to add from two to four per cent of an alloy composed of sixteen per cent chromium and one per cent phosphorus, the balance being copper. This alloy is made in a crucible steel melting furnace, the chromium being melted first, as a high temperature is required to melt the chromium.

POURING HEAVY COPPER CASTINGS

When pouring the molds for heavy copper castings it is necessary to keep the pouring basin full of metal all the time the mold is taking metal; great care being necessary to guard against the metal sucking air into the mold with it, as under certain conditions it forms gas, which being absorbed by the molten copper, causes "spewing up" in the risers.

SKILLFUL OPERATION NECESSARY

To succeed in getting sound copper castings the melting has to be carefully and skillfully conducted, no matter what kind of a furnace is used. This applies to the cupola, probably more than with any other furnace, and the method the author has attempted to outline has given very good results. The castings made were not intended to be used for purposes where high electrical conductivity was important, otherwise, the phosphor copper could not have been used as a deoxidizer, and as a consequence it might have been more difficult to eliminate the gases and obtain sound castings. This we do not know, as it has not been necessary to make such castings.

Brass castings can also be made from cupola-melted metal, if the same precautions as described are used in melting the copper. The zinc, however, should be added in the ladle. To prevent chilling of the copper, the zinc must be pre-heated to a temperature just below the melting point. In the case of either brass or copper it is necessary to have it hot, when it is melted in a cupola furnace.

High Speed Airplane

Metals Used in the Construction of Machines Built to Travel 200 Miles Per Hour

Written for The Metal Industry by Commander H. C. RICHARDSON, Construction Corps, U. S. Navy, Bureau of Aeronautics, Navy Department, Washington, D. C.

Industry is interested in the racing planes which took part in the Pulitzer Trophy Races at Dayton, Ohio, on the 3rd, 4th and 5th of October, and in the Schneider Cup Seaplane Races at Baltimore on October 24th and 25th.

The Pulitzer Trophy Race is for landplanes and the Army entries should make about 220 miles per hour. The Schneider Cup Races are international and at least one foreign entry will compete. In these races also 220 miles per hour as seaplanes is anticipated. The U. S. Navy has three entries as defenders of the cup which they captured in England last year with the CR-3 averaging 177 miles per hour on a triangular course. One of these entries is the same as last year, but it has been tuned up to about 197 miles per hour straightaway. Two other entries, one Curtiss and one Wright built, are the same as participated in the Pulitzer Trophy last year at St. Louis, where as a landplane the Curtiss R-2-C made 244 miles per hour on a triangular course, and later made 266.6 miles per hour over a straightaway.

Industry is particularly interested in all these racers, as they all use wing type radiators made of corrugated brass, which forms two-thirds of the wing surface and while acting as a radiator conforms to the shape of the wing in such a manner as to interfere only slightly with the wing performance. In this manner the radiator resistance is reduced to a minimum.

The cowling of these planes is also of interest, particularly the engine cowling. It is formed from aluminum sheet and is a beautiful piece of "bumping." The success of these designs depends in no small degree on the attention paid to the detail, and to the remarkable compactness of the D-12 engine used in these planes. The propeller spinner is made of spun aluminum. To save weight the gasoline tanks are made from welded aluminum sheet. The gas lines are copper to resist vibration.

Aside from our trade interest we are naturally interested in the perfection of the designs by American manufacturers and the skill and daring of the service pilots who drive these planes at such terrific speed. The speed is so great that at times the pilots become nearly unconscious as the blood is drained from their brains by centrifugal force. This force increases their apparent weight to nearly eight times normal. This lasts only for a second or two, but the critical period when surest judgment is involved must depend on the remarkable qualities of reflex action.

Effect of Temperature Upon Metals

The Tensile Strength and Elastic Limit, and the Torsional Strength and Elastic Limit at Various Temperatures

Written for The Metal Industry by ERNEST G. JARVIS, Vice President and General Manager Niagara Falls Smelting & Refining Corporation, Buffalo, N. Y.

Tensile Strength & Elastic Limit

		75°	100°	200°	300°	400°	500°	600°	700°	800°	900°	1,000°
STEAM METAL	Tensile Strength	33,000	33,000	33,000	33,000	30,000	24,000	18,000	16,000	15,000	14,000	12,000
	Elastic Limit	25,000	23,000	21,000	19,500	19,500	18,500	17,000	16,000	15,000	12,000	7,000
CAST MONEL	Tensile Strength	53,000	53,000	53,000	53,500	54,000	52,000	48,000	44,000	39,000	33,500	29,000
	Elastic Limit	30,000	29,000	26,500	25,000	24,500	24,000	24,000	24,000	24,000	24,000	24,000
MANGANESE BRONZE	Tensile Strength	55,000	54,000	52,000	48,000	48,000	37,000	28,000	20,000	12,000	2,000	.....
	Elastic Limit	32,000	32,000	30,000	29,000	28,000	22,000	16,000	10,000	4,000	.....	.....
GUN METAL	Tensile Strength	33,000	33,000	33,000	33,000	28,000	26,000	18,000	16,000	15,000	14,000	13,000
	Elastic Limit	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
PURE NICKEL	Tensile Strength	38,000	39,000	40,000	41,000	40,000	39,000	37,000	34,000	32,000	28,000	18,000
	Elastic Limit	23,500	24,000	24,500	24,500	25,000	24,500	24,000	23,000	20,000	17,000	14,500
30% NICKEL STEEL ROLLED	Tensile Strength	94,500	95,000	96,500	97,000	95,000	87,000	73,000	62,000	52,000	45,000	39,000
	Elastic Limit	39,000	39,000	37,000	36,000	35,000	32,000	28,000	26,000	22,000	19,000	16,000
U. S. N. BRONZE S. C.	Tensile Strength	29,000	28,500	27,500	27,000	25,000	22,000	17,000	12,000	8,000	5,000	2,000
	Elastic Limit	16,500	16,000	15,000	14,000	13,000	12,000	11,500	10,000	9,500	7,500	6,000
U. S. N. BRONZE G.	Tensile Strength	34,500	34,500	35,000	35,500	33,500	31,000	27,000	22,500	17,500	12,500	7,500
	Elastic Limit	25,500	25,000	23,500	22,000	21,500	21,000	20,500	19,000	16,000	12,500	6,500
U. S. N. BRONZE M.	Tensile Strength	35,500	35,500	34,500	34,000	32,000	28,000	16,500	14,000	12,000	8,500	6,500
	Elastic Limit	18,500	18,000	16,500	16,000	15,000	15,000	15,000	13,500	11,500	9,500	6,500
ROLLED MONEL	Tensile Strength	104,000	100,000	100,000	100,000	98,000	96,000	89,000	78,000	66,000	56,000	47,000
	Elastic Limit	76,000	75,000	70,000	65,000	61,000	58,000	53,000	48,000	40,000	34,000	28,000
ROD BRASS	Tensile Strength	55,000	54,500	54,500	53,500	49,500	43,500	36,000	26,000	16,500	10,500	3,000
	Elastic Limit	45,000	45,000	44,000	42,500	40,000	35,000	25,500	17,500	13,500	7,500	2,000

Torsional Strength & Elastic Limit

		75°	100°	200°	300°	400°	500°	600°	700°	800°	900°	1,000°
MACHINE STEEL	Torsion Strength	59,000	58,000	55,000	51,500	47,000	41,500	36,000	31,000	26,000	21,500	17,500
	Elastic Limit	24,500	23,500	20,500	16,500	13,500	10,000	7,500	4,500	2,500	9,000	5,000
COLD ROLLED BES. .093 CARBON	Torsion Strength	75,000	74,000	69,000	64,000	58,000	51,000	41,000	28,000	16,000	11,000	3,000
	Elastic Limit	42,000	41,000	39,000	35,000	32,000	27,000	22,000	15,000	7,000	1,000	300
CUMBERLAND C. R. SHAFTING	Torsion Strength	69,000	69,000	66,000	63,000	60,000	50,000	37,000	27,000	18,000	8,000	900
	Elastic Limit	68,000	69,000	67,000	64,000	59,000	50,000	37,000	27,000	17,000	8,000	900
25% NICKEL STEEL	Torsion Strength	102,000	100,000	91,000	82,000	72,000	63,000	53,000	39,000	25,000	11,000	3,000
	Elastic Limit	17,000	16,000	12,000	9,000	7,000	5,000	5,000	5,000	4,000	4,000	3,000
30% NICKEL STEEL	Torsion Strength	90,000	89,000	80,000	71,000	61,000	61,000	41,000	31,000	21,000	11,000	.....
	Elastic Limit	21,000	21,000	19,000	16,000	15,000	14,000	11,000	8,000	6,000	4,500	2,500
VANADIUM TOOL STEEL	Torsion Strength	137,000	136,000	130,000	126,000	115,000	89,000	65,000	37,000	14,000	5,000	3,000
	Elastic Limit	52,500	51,000	45,000	40,000	36,000	27,000	20,000	15,000	10,000	8,000	5,000

		75°	100°	200°	300°	400°	500°	600°	700°	800°	900°	1,000°
TOBIN BRONZE	Torsion Strength	62,000	60,000	50,000	41,000	32,000	19,000	7,000	.....	.....	.....	.....
	Elastic Limit	24,000	22,500	16,500	12,000	7,500	4,000	3,000	2,000	1,000	300	100
PHOSPHOR BRONZE	Torsion Strength	70,000	68,000	61,000	54,000	45,000	33,000	18,000	5,000	.....	.....	.....
	Elastic Limit	62,000	59,000	45,000	34,000	22,000	13,500	7,000	5,000	3,000	1,000	100
PARSON'S MANGANESE BRONZE	Torsion Strength	61,000	59,000	51,000	42,000	32,000	22,000	10,000	.....	.....	.....	.....
	Elastic Limit	22,000	21,000	18,000	15,000	12,000	7,000	3,000	.....	.....	.....	.....

Bearings for Electric Motors

Discussion of Paper of A. C. Cummins on "Developments in Electric Repair Shop Practice"*

By JESSE L. JONES

Metallurgist, Westinghouse Electric & Manufacturing Company

This discussion is confined to the six questions listed under Section (g) of the paper, viz.:

Q. 1.—What is the permissible radial wear in D. C. armatures?

A. This would depend upon the type of machine, air gap, etc. In 2,000 k.w. machines with a double air gap of 5/8 inch or 5-16 inch on a side, a wear of 1/8 inch might be permissible.

Q. 2.—What is the permissible radial wear in induction rotors?

A. No very definite answer can be given to this question either. The air gap on large rotors is from 1/8 to 1-10 inch on a side and the only safe procedure would be to measure this gap at regular intervals. Usually, the wear is very slight. In the case of one rotor fitted with lead-base babbitt bearings that has been in service in a rolling-mill for 20 years, a wear that was almost negligible was found.

Q. 3.—Have you found any quick way to inspect bearings for radial wear that is dependable?

A. Wear is always greatest on the bottom half of a bearing. Measuring the air gap when a machine is installed and subsequently at regular intervals is a reliable method of inspection.

Q. 4.—In rebabbitting shells, is it always necessary to first tin shells as recommended by manufacturers?

A. Tinning is very essential. Shells should always be tinned with wiping solder which has a low melting point and a long melting range. The solder should be still dripping when the shell is babbitted, in order to assure the proper adherence of the babbitt. Tinning with babbitt is possible, but its melting point is so high that it sets before the shell can be put in position on the mandrel, and, when poured, a loose lining results, the only adherence being where the stream of babbitt strikes the shell continuously.

Q. 5.—Do you use any especial care in handling babbitt? If a change in babbitting has recently been made, have you noted any superior service? Does pyrometer equipment actually enable babbitt men to do enough better work to justify the investment?

A. If either a lead or tin base babbitt is heated much above 500 deg. C., considerable antimony is lost by volatilization. However, more bearings are spoiled by underheating than by overheating. Unless a fairly high temperature is maintained, the copper, antimony and other hardening metals of the babbitt are thrown out of solution, skimmed off as dross and a soft, unserviceable bearing results. A range of between 460 deg. C. and 482 deg. C. will be found to give good results with most babbitts. The mandrel should be heated to 100 deg. C. to 125 deg. C. A very fine grain in a babbitt lining is desirable and this depends more upon the rate of setting than upon the temperature at which the metal is poured. The water-cooling of mandrels may be resorted to in order to assist in obtaining the proper grain in the babbitt lining. The use of very thick linings, of anchor-holes or dove-tails and of peening is undesirable.

There are no recent innovations in babbitting that are of especial value. The centrifugal babbitting of bearings has aroused considerable interest and in the case of solid shells, Diesel engine bearings, etc., it has proved very satisfactory. It requires considerable equipment, but can be carried out by unskilled labor. The babbitting of half shells and shells containing lubricating windows by this method offer certain difficulties.

A pyrometer equipment is desirable, but not essential. With an unskilled man who does not babbitt regularly, a pyrometer is useful. A skilled man can judge the temperature of the molten babbitt closely enough by stirring it with a pine stick or by observing its fluidity.

Q. 6.—Do modern babbitt bearing designs eliminate oil from armatures? What does shop observe?

A. Present bearing designs are generally satisfactory. Oil troubles in the past have often been due to poor adherence of the babbitt to the shell or to large blow-holes next to the shell that were not visible after machining. This allows the oil to accumulate between the shell and the babbitt lining. When a motor with such lining is started up, it often throws out a spray of oil that may cause considerable trouble.

*Iron and Steel Engineer, September, 1924, p. 451-2.

Reclaiming Gun Barrels by Nickel Plating

Reclamation of wornout machine gun barrels by plating the bore with nickel or other suitable metal and then re-rifling, has been suggested by the Bureau of Standards of the Department of Commerce. This process was tried at the bureau a few years ago, but at that time proved unworkable. Progress in the science of electro-plating has been very rapid in recent years, however, and it is hoped that what was impossible then may be possible soon.

Gun barrels wear out through erosion of the rifling bands, and when these are worn down to a certain point the gun is no longer accurate. If the rifling could be rebuilt the gun would again be serviceable. This, the bureau hopes, can be done if a sufficiently hard and dense deposit can be plated into the bore. The metals considered best are nickel, cobalt, iron and chromium.

Most of the experiments were conducted with nickel because of the more advanced stage of nickel plating as compared with that of other metals. A taut platinum wire, centered in the bore, was used as an anode, and in order to furnish nickel a stream of fresh solution was constantly circulated through the barrel.

Railroad Plating Work

Importance of Electro-Plating in Connection with Great Railway System

Written for The Metal Industry by FRANCIS DICKIE, Heriot Bay, B. C., Canada

The average traveller across the continent on a de-luxe passenger train will probably not realize the tremendously important part the operation of electro-plating plays in countless objects about him. Practically all metal hardware parts of passenger equipment interiors are plated, many of the engine parts, including the copper reflector of the headlight are plated, and various platings are used

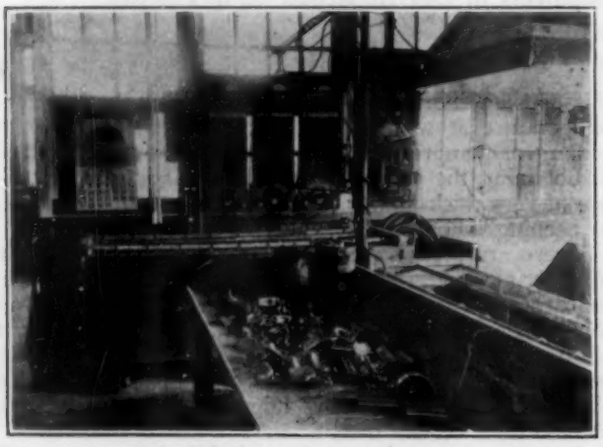

FIG. 1. BENCH FOR WIRING CAR TRIMMINGS

on a thousand and one articles which are a part of a great transportation system. The traveller may notice the silver plating, but a great many other metals are also used. Gold, for instance, is used by the Canadian Pacific Company for pepper castor tops and similar articles of the table; copper on lighting and car fixtures; zinc on refrigerator hardware; nickel on kitchen utensils; tin on trainmen's lanterns; mercury on telegraph elements, and aluminum and lead on miscellaneous articles.

So important a side-line is electro-plating that the Canadian Pacific Railway Company, operating, as it does, the largest transportation system in the entire world, under a single direction, found it recently advisable and economical to devote an extensive plant at its Angus Shops in Montreal, where electro-plating alone is carried on to look after the needs of the entire system.

Fig. 2 shows two locomotive electric headlight reflectors in the process of being silver-plated. In this case

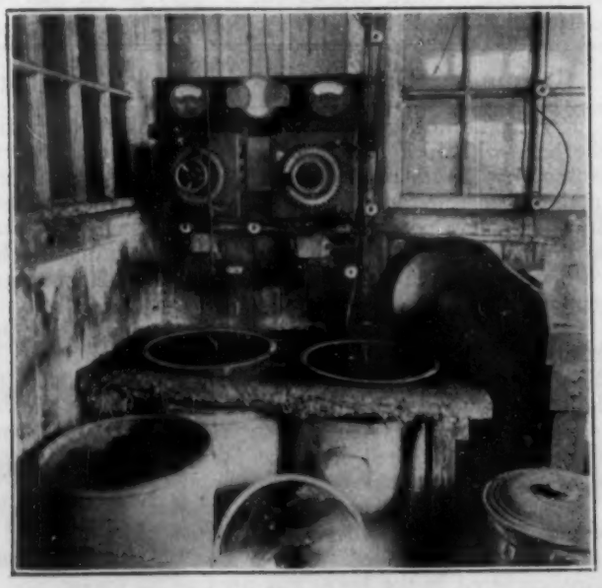

FIG. 2. EQUIPMENT FOR SILVER PLATING HEADLIGHT REFLECTORS

FIG. 3. BURNISHING HEADLIGHT REFLECTORS

the anode of silver is suspended in the center of the reflector, which is filled with cyanide solution.

Fig. 3 shows the following step in the treatment of the reflector, which, it may incidentally be noted, gives a very high concentration of light. In the work of hand burnish-

FIG. 4. BUFFING CAR TRIMMINGS

ing, two reflectors are all a skilled workman can complete in a single day. On articles which can be readily polished on a buffing wheel (see Fig. 4) the operator accomplishes, of course, much more than he possibly could do by hand.

Upon the completion of the polishing, articles to be lacquered are placed in a metal container, and, by means of a small compressed air gun, sprayed with suitable lacquer. In many cases where the article is required to harmonize with the woodwork or other interior material of a car, it is oxidized prior to the application of the finishing coat of lacquer.

The shop, as shown in the accompanying illustrations, recently put into operation by the Canadian Pacific at Montreal, is the first of its kind to be operated by that railroad. It has been found to effect a very large saving and a large number of men are now employed solely on this work.

FIG. 5. SPRAYING LACQUER ON STATUARY BRONZE CAR TRIMMINGS.

Black Nickel Plating

Composition of Solution and Methods of Analysis for Controlling It

Written for The Metal Industry by HARRY BUDDINGTON MAXWELL, Plater

The object of the following experiments was to get a solution that would give a flat black color on articles drawn from sheet brass without buffing the surface of the work after the forming was completed. At first the solution recommended by the Bureau of Standards made up as follows, was tried:

Nickel and Ammonium Sulphate	8 oz.
Zinc Sulphate	1 oz.
Sodium Thiocyanate	2 ozs.
Water	1 gal.

The best potential to use with this bath was found to be from 0.5 to 0.6 volt. On polished and buffed work this gives a very good black plate, but on a dull surface it does not give a black color. Several changes were made in the proportions of the various contents of this solution. First, more thiocyanate was added by half ounce additions up to 3 oz. per gallon, but with no improvement; then adding zinc sulphate by half-ounce steps until a total of five ounces per gallon was used. This gave a decided improvement up to a content of three ounces per gallon, but even with this change the working of the solution was erratic and it was found that while some of the articles would be of a good color others in the same tank would come out with iridescent colors on them.

After two weeks' hard work this solution was abandoned and one made up as follows:

Nickel Chloride	8 oz.
Zinc	1 oz.
Sodium Thiocyanate	2 ozs.
Water	1 gal.

All voltages from 0.4 to 1.25 were tried and it was found that 0.7 volt was the best voltage at which to work this bath. This solution gives a good flat black color which matches very nicely the imitation rubber japan that part of the article is coated with.

The pH of this bath should run from 5.7 to 6.3.

The anode corrosion is very good and the main thing to keep track of is the content of zinc chloride and sodium thiocyanate. It is evident that as this bath is a chloride solution, the standard method of analyzing for NaCNS with standard solutions of silver nitrate and sodium thiocyanate by titration will not be advisable, so the following method was worked out:

ANALYZING FOR SODIUM THIOCYANATE (NaCNS)

Take 10 cc. of the solution, dilute to 25 cc. and as the commercial chlorides of nickel and zinc usually contain some sulphates it is necessary to precipitate these sulphates. Do this by adding 10 per cent barium nitrate solution until no more precipitate forms. Filter through double filter paper, discard precipitate and add to the filtrate a little more than the calculated amount of concentrated nitric acid to oxidize the thiocyanate to sulphuric acid. Bring to a boil, let stand fifteen minutes and filter through a tarred Gooch Crucible.

Ignite at low red heat five minutes and weigh as barium sulphate $BaSO_4$.

$BaSO_4 \times 100 \times 0.134 \times 0.347 =$ oz. NaCNS per gal.

ANALYZING FOR NICKEL CHLORIDE ($Nicl_2$)

Take 10 cc. solution, add 7.5 cc. concentrated nitric acid (HNO_3) and 5 cc. sulphuric acid (H_2SO_4) to destroy the thiocyanate then take down to fumes; cool and dissolve in distilled water. Neutralize with ammonia (NH_4OH) and acidify with 1 cc. acetic acid. Bring nearly to a boil and add calculated amount of dimethylglyoxime $(CH_3)_2C_2(NOH)_2$ stirring vigorously while adding.

Be sure to have at least twice the amount of water than the amount of dimethylglyoxime solution. Heat on water bath for twenty minutes, filter on a tarred Gooch crucible and weigh as $NiC_8H_{14}N_4O_4$ after drying two hours at 105°C.

$NiC_8H_{14}N_4O_4 \times 100 \times 0.134 \times 0.8228 =$ oz. $NiCl_2$ per gallon.

ANALYZING FOR ZINC CHLORIDE ($zncl_2$)

To the filtrate from the above add 20 cc. concentrated hydrochloric acid (HCl) and boil to destroy the oxime. Cool solution and add an excess of sodium ammonium phosphate ($NaNH_4HPO_44H_2O$). Neutralize with ammonia (NH_4OH) adding a drop or two in excess. Acidify with acetic acid and heat on hot plate one hour. Filter on a tarred Gooch Crucible and weigh as $Zn_2P_2O_7$.

$Zn_2P_2O_7 \times 100 \times 0.134 \times 0.894 =$ oz. $ZnCl_2$ per gallon.

The Aluminum Industry in America

In view of the widespread discussion in the daily press of the Aluminum Company of America, we have thought it useful to present, simply and without prejudice, the facts about this company as they exist.

In 1886 Charles M. Hall of Oberlin, Ohio, discovered a practical method of extraction of pure aluminum which consisted of the solution of aluminum oxide in molten fluorides, and subsequent electrolysis therefrom. In 1888 Captain Alfred E. Hunt, together with some of his friends, formed a corporation, known as the Pittsburgh Reduction Company, for the exploitation of this process. The original officers of the company were Alfred E. Hunt, president; Charles M. Hall, vice-president; Arthur V. Davis, secretary and general manager.

After many difficulties and discouragements, a plant was put into operation and it was attempted to sell aluminum in the open market. Due, however, to the fact that it was something entirely new, that it was difficult to cast and to work, and that it was susceptible to improper handling, the progress was slow. Added to these, the fact that the price was high—$1.50 a pound, a condition existed which only a concern, well-financed and operated by patient officers and stockholders, could live through. It was found that sheet aluminum rolled in brass mills and steel mills was unsatisfactory and for that reason the company in 1893 had to install its own rolling equipment. The price of the metal was sagging until in 1895 it dropped as low as 35 cents. This low price made it necessary to decrease the cost of production and new power sites were located, one of which was at Niagara Falls.

In 1899 Captain Hunt died and R. B. Mellon was elected president, the Mellon family having been interested in the company for some time and having supplied a large part of the funds necessary for its development.

From 1900 on the business of the company increased rapidly and new plants were located at strategic points. It was necessary also to install power plants entirely for its own use. In 1906 the name of the company was changed from the Pittsburgh Reduction Company to the Aluminum Company of America. In 1907 its business suffered as did all others during that depression, but revived again and in 1915 and 1916 expanded under pressure of war orders. The present status of the Aluminum Company of America, as taken from Moody's Manual for 1924, is as follows:

DIVIDENDS

1906— 3½%	1915— 6½%
1907—11	1916— 8+2 (extra) =10
1908— 1	1917— 8
1909— 2	1918—10
1910— 4	1919—10
1911— 4	1920—10
1912— 4	1921— 6
1913— 4	1922— 6
1914— 6	1923—10

BALANCE SHEET—JULY 31, 1923

ASSETS

Plant and Equipment (less depreciation)	$89,077,253
Cash	2,398,404
U. S. Govt. Bonds	3,621,117
Bills and Accounts Receivable	7,297,150
Investments (Allied companies & marketable securities	13,973,508
Inventories	33,394,772
(Prepaid expenses and deferred charges to operations)	2,866,258
Total	$152,628,462

LIABILITIES

Capital Stock	$18,729,600
[1]6% Serial Gold Notes—March 1, 1922	4,000,000
[1]6% Serial Gold Notes—March 1, 1923	4,000,000
7%—5 year notes—November 1, 1925	12,000,000
Bonds and Mortgages subsidiary companies	648,989
Bills payable	17,208,150
Accounts payable	1,349,409
Contingent reserves	1,206,542
Deferred credits and accruals	1,331,911
Surplus	92,153,861
Total	$152,628,462

Issued October 1, 1921. Debenture Bonds due October 1, 1933, $18,000,000

[1] Since paid off.

The output of aluminum has always been a difficult thing to ascertain, due to the policy of the company. According to the United States Census Bureau in 1923 the value of the products made by the entire industry was about $107,000,000. The industry includes 119 establishments and employs about 16,300 workers.

This development is one of the industrial romances of the last two decades. Aluminum is now of utmost importance in automobiles, airplanes and dirigibles like the Shenandoah and the ZR-3. The fact that Duralumin* has the strength of mild steel and only one-third its weight has advanced the flying industry enormously. Aluminum is used in large quantities for electrical transmission, and for a hundred and one other uses, such as wrapping food products in the form of foil, for motor boats, etc., and one of its largest and mose extensive uses is for kitchen utensils where it has become practically standard home equipment. THE METAL INDUSTRY and its predecessor, The Aluminum World, have followed the development of aluminum for the past thirty years, publishing the methods of working and fabrication from the ingot stage to the finished product, and giving all information about the technology of aluminum and its alloys. In THE METAL INDUSTRY for January, 1909, pages 8-10, is an article entitled Twenty Years of Aluminum Manufacture, giving the history of aluminum in brief up to the date of that article.

The following table shows the production of aluminum in the United States in comparison with the importations:†

Year	Production of Aluminum in United States in pounds	Importations of Aluminum into United States in pounds	Ratios of Importations to Domestic Production P. C.
1910	34,000,000	12,000,000	35
1911	37,000,000	6,500,000	18
1912	40,000,000	16,000,000	40
1913	46,000,000	28,000,000	61
1914	58,000,000	19,000,000	33
1919	128,000,000	14,000,000	11
1920	138,000,000	39,000,000	21
1921	54,000,000	33,500,000	62
1922	74,000,000	44,000,000	60
1923	129,000,000	43,000,000	33

* Composition of Duralumin is approximately as follows: Aluminum, 94; Copper, 4; Manganese, .5; Magnesium, .7; Iron, .5; Silicon, .3.

† From a statement to the daily press by Secretary Mellon, published in the New York Times, September 28, 1924.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers, Inc.

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Contents

EDITORIAL

THE FOUNDRYMEN'S CONVENTION

With 5,000 visitors, and with one of its best technical programs (described elsewhere in this issue), the Milwaukee Convention of the American Foundrymen's Association, and the Institute of Metals Division, stands out as one of the biggest and best ever held. While no manufacturers showed new equipment of a startling or revolutionary character, the exhibits were most interesting and showed a healthy trend toward the standardization of devices which have in the past been, more or less, in a state of flux. Electric furnaces have very definitely come into their own. Crucibles have held up their end and the development of the corborundum crucible has proved to be a real advance. Sand-blasing equipment, while not new in principle, is expanding into all sorts of special lines. Molding machines are, of course, now an old stand-by, perhaps not in jobbing brass foundries as much as they should be, but certainly in production foundries.

The technical program was of a very high order, the papers eliciting considerable discussion and in several cases, bringing out really unusual developments. T. F. Jennings' description of the use of the cupola for melting casting copper was an excellent exposition of a difficult "stunt," and drew not only discussion but favorable comment from the hearers. J. L. Jones reported real progress of the Committee on the Non-Ferrous Metals. This committee has made a long step forward in laying out its work so thoroughly, and co-operating with the American Society for Testing Materials. We are confident that excellent results will come from their work.

The aluminum session resulted in lively discussions. Considerable interest was shown in permanent molds for aluminum casting, and the unusual opinion was expressed by one or two present, that they preferred this process to die-casting. The silicon-aluminum subject brought up many differences of opinions, but showed conclusively that the use of this new alloy was of utmost importance and would spread very widely. S. Daniels made a good contribution with his description of the heat treatment of the high copper duralumins, which developed such a fine combination of strength and ductility. One of the most important topics taken up at the convention was that of Sand Research. The work of the American Foundrymen's Association on sands has been invaluable in clearing up a subject which was, until very recently, shrouded in mystery. Standard testing apparatus has now been developed and although it will probably be improved and simplified from time to time, it has reached the stage where it is practical for actual foundry use. For work specializing on brass, the paper by F. L. Wolf and A. A. Grubb is of particular interest.

Leaving as it did a lapse of eighteen months between the last two meetings, the Executive Committee of the American Foundrymen's Association, showed its wisdom, which was proved by the attendance in Milwaukee. It is hoped, however, that with major business depressions over, and in view of the fact that this convention was so successful during a comparatively quiet period, the next convention will be held on schedule.

ALUMINUM IN POLITICS

For the last few weeks we have been edified by the spectacle of a political campaign, raging about a highly technical subject. It seems that the Aluminum Company of America and Mr. Andrew D. Mellon, Secretary of the Treasury, who is heavily interested in this company, have been accused of profiting excessively by the tariff placed on aluminum ingot and aluminum manufactures. Charges have been thrown back and forth and statistics also tossed about in the same way, in one or two cases much to the detriment of said statistics.

To cover in detail all the arguments pro and con would take much more space than we have to spare or than the subject merits. The facts, however, so far as we have been able to determine, are as follows:

The Aluminum Company of America was organized in 1889 (as the Pittsburgh Reduction Company at that time) and for many years struggled to educate both the manufacturing and consuming public to use aluminum. For a number of years no dividends were paid, the final total capitalization of the company mounting up to $18,729,600. The year 1907 showed a dividend of 11%, but in 1908 only 1% was paid, and after that, 1914 was the first year to yield as much as 6%. Since then the highest dividend paid has been 10%, this amount being paid in the years 1918, 1919, 1920 and 1923. The company has made large profits but has put most of them back into increased plant, equipment and sources of supplies of raw materials.

Undoubtedly the tariff has helped the Aluminum company but since it has seemed to be the policy of this company to take advantage of the tariff by raising its prices, importations have not been stopped but have been coming in, it has been stated, at the rate of 30% of domestic production.

A complicating feature is the fact that the Federal Trade Commission has lodged a complaint against the Aluminum company on the ground that it has violated the Sherman Anti-Trust Act. Exact terms of this complaint have not clearly been made public but are contained in a report which the Federal Trade Commission has submitted to the Department of Justice for consideration. It seems, however, from the daily press reports, that they are roughly as follows: 1. Delaying or refusing shipments of materials to competitors in the business of manufacturing aluminum goods. 2. Charging higher prices for crude or semi-finished aluminum to competitors than to companies in which they are themselves interested. 3. Refusing to sell crude or semi-finished aluminum to prospective competitors.

As regards these charges, of course it is impossible for an outsider to judge since no outsider has all the facts at his command. Before expressing any opinions, it will be necessary to wait for the report from the Department of Justice, and then to watch for subsequent legal developments. The point at issue, clouded as it has been by political oratory and mud-slinging, is not whether the Aluminum company has a monopoly. As a matter of fact it is denied by no one that the Aluminum company has a practical monopoly on the American production of aluminum ingot, and is therefore the only domestic source of supply for manufacturers of aluminum goods. The real point is whether or not the Aluminum company has been so conducting its business as to be fair to subsidiaries and outside concerns alike. Its profits seem to have been turned back into the business; its dividends have not been excessive; its acts as a business concern are being investigated by the proper and recognized authorities. This covers practically the whole situation.

PLATERS RESEARCH CONFERENCE

On November 14 and 15 in Washington, D. C., there will be a joint research conference of the Bureau of Standards and the Research Committee of the American Electro-Platers' Society. We have been asked to publish the following communication from the Research Committee, which we do with pleasure:

At this joint conference it is expected that in addition to the bureau staff and the A. E. S. Committee each branch will send an official representative. Further than this all other platers and manufacturers' representatives interested in the finishing of metals are urged to attend and will be very welcome.

It is not the primary aim of this meeting to make it the occasion for announcing further results of the bureau's research staff although its recent work will be reviewed. The principal object is to familiarize the plating profession with the bureau's methods and facilities for research procedure in order to stimulate further suggestions as to what other work should be undertaken and how results already achieved can be made available to the industry in practical form.

The conference will take the form of several meetings with talks by members of the bureau's staff, open discussions on various topics, visits to the research laboratories and possibly to other government departments where plating technique as developed by the bureau can be demonstrated in practice.

All persons planning on attending the conference should notify the Chairman of the Research Committee or Dr. Blum in order that further notices and information can be sent them direct.

A. E. S. Research Committee.
Philip Uhl,
S. E. Heddon,
R. L. Shepard, Chairman.

Mr. Shepard states that in his personal opinion, the industry as a whole is not making the use that it should of the results obtained by the Bureau of Standards, and that this is due to a lack of appreciation of its possibilities in omproving quality or reducing costs. It is the aim of the committee to get this very valuable information to the platers and manufacturers and to focus their atention upon it.

We heartily second Mr. Shepard's remarks and wish him all possible success in his work.

"GOLD FILLED"

The question of definitions is always difficult, but they are sometimes particularly difficult in the jewelry trades. A short time ago we were asked by a subscriber to give an exact definition of the term "Gold Filled." We were surprised to find that we ourselves were unable to give anything definite; we were later still more surprised that nothing of value could be found in the ordinary literature on precious metal alloys, and we were surprised most of all, when we called up the National Jewelers Board of Trade, to receive a flat refusal to give the definition of "Gold Filled" over the telephone. This organization very kindly sent us in writing, however, the following statement which should be of interest and considerable value to everyone interested in gold and gold alloys.

Following your inquiry over the telephone this morning, we are pleased to quote you excerpts from the proposed new Stamping Law which has been drafted by a number of committees in the trade, including the Jewelers Vigilance Committee, New England Manufacturing Jewelers and Silversmiths Association and Jewelry Crafts Association, as quoted by counsel to these committees, Morris L. Ernst:

"Gold-filled articles are described as articles upon all sides of which a sheet or sheets of gold are affixed by soldering, brazing or other mechanical means."

"Rolled gold plate articles are described as articles upon at least one side of which a sheet or sheets of gold are affixed by soldering, brazing or other mechanical means."

"Gold plate is defined as an article, all of the exposed metal surfaces of which are coated with gold by electro or chemical processes, other than fire gilt, and the term 'Gold Plate' may not be accompanied by a karat mark or any other quality mark, and may not be abbreviated."

"Fire gilt is defined as an article, all of the exposed metal surfaces of which are coated with the fire gilt process, and the term 'Fire Gilt' may not be accompanied by a karat mark or any other mark, other than a trade-mark and may not be abbreviated."

We suggest, for those who have not this information already on file, clipping or copying the above communication. The question seems to need much more careful attention than one would ordinarily think, but it is encouraging to know that the various jewelers organizations have taken the matter in hand and are working out standard terms.

GOVERNMENT PUBLICATIONS

Bismuth, Selenium, and Tellurium in 1923. By Victor C. Heikes, U. S. Geological Survey, Washington, D. C.

Coal in 1922. By F. G. Tryon and Sydney A. Hale. U. S. Geological Survey, Washington, D. C.

Graphite in 1923. By Jefferson Middleton. U. S. Geological Survey, Washington, D. C.

Quicksilver in 1923. By Clyde P. Ross, with a supplementary bibliography by Isabel P. Evans. U. S. Geological Survey, Washington, D. C.

Tin in 1923. By Bertrand Leroy Johnson. U. S. Geological Survey, Washington, D. C.

Zinc in 1923. By C. E. Siebenthal and A. Stoll. U. S. Geological Survey, Washington, D. C.

Platinum and Allied Metals in 1923. By James M. Hill. U. S. Geological Survey, Washington, D. C.

Mineral Resources of the United States in 1923. Introduction by Frank J. Katz. Statistics assembled by Martha B. Clark. U. S. Geological Survey, Washington, D. C.

Magnesium and Its Compounds in 1923. By J. M. Hill and G. F. Loughlin. U. S. Geological Survey, Washington, D. C.

Bauxite and Aluminum in 1923. By James M. Hill. U. S. Geological Survey, Washington, D. C.

New Books

Polishing and Plating of Metals, by Hawkins. Published by Hazlitt & Walker. A new edition of this old standard work is being printed and will be published in the near future. An extended review is impossible, but the popularity of the older work makes it certain that all platers and chemists interested in electro-plating will watch for this manual covering polishing, plating, buffing, oxidizing, and lacquering.

Metallurgy of Aluminum and Aluminum Alloys. By Robert J. Anderson. Published by H. C. Baird & Company, Inc. Size 6¼ x 9¼, 800 pages, 295 illustrations. Price payable in advance, $10.00; ready for distribution in January, 1925.

This is a modern and practical treatise on the metallurgy of aluminum and its alloys covering the subject from the mining of the ores to the fabrication of the metal and its applications. It should be of interest to foundrymen and metallurgical engineers; also to mechanical engineers who must be familiar with the properties and uses of aluminum in order to specify it properly. It has been written essentially from the practical viewpoint, but the theoretical aspects have been taken care of, and the book should be not only a guide, but a standard reference work.

The subjects covered include the following: History, development and ramifications of the aluminum industry; origin; occurrence and distribution of aluminum ores; production of aluminum; physical and chemical properties of the metal and its alloys; corrosion; uses and applications; preparation of alloys for casting and working; melting practice; production of alloys from scrap.

The author is widely known as an expert on aluminum through his work with the Bureau of Mines.

Management's Handbook. Edited by L. P. Alford. Published by Ronald Press Company. Size 4½ x 7 inches, 1610 pages. Price payable in advance, $7.50. For sale by THE METAL INDUSTRY.

This volume is a pioneer publication—the first handbook of management.

It is devided into 32 sections, each of which is sub-divided into several parts, and each section has been assigned to a specialist in that field. An idea of the scope of this work can be gained by going over some of these sections, among which are the following: tables and statistics; charts; management ratios; plant layout; purchasing and storekeeping; tool storage and issue, production control; material handling; operation study and rate setting; plant maintenance; conserving and salvaging materials; packing for shipment; budgeting control; cost accounting; banking relations; market analysis; labor maintenance; information filing system.

The book is a monumental piece of work and will be most valuable to those interested in plant operation and management. It offers for the first time a compact and authoritative body of information which was formerly scattered throughout the vast literature of that subject.

Technical Papers

Self Corrosion of Lead Cable Sheath. By F. O. Anderegg and R. V. Achatz. Bulletin No. 18 of the Engineering Experiment Station, Purdue University, Lafayette, Ind.

Causes of Corrosion: In general the most important cause of corrosion is the presence of organic matter in the soil. Decomposition of the organic matter produces acids that tend to attack the material of the cable sheath. Corrosion product was obtained from about 80 per cent of the cables inspected and in nearly every case tests for acetic acid were obtained. Decaying wood and vegetable matter produces this acid and, hence, it is inadvisable to use untreated wood boards as a protection for the cable.

Alkali in the form of limestone, concrete, gypsum, etc., also is a direct cause of corrosion in some cases, and in all cases, is likely to increase the corrosion rate. Salts, particularly common salt, may also be a cause of corrosion due to local galvanic action.

Factors Which Increase Rate of Corrosion. In general, the rate at which corrosion takes place increases with the amount of organic matter in the soil. This conclusion was supported both by field and laboratory observations. In the laboratory, the order was found to be (1) muck, (2) cinders, (3) sand, (4) clay. Corrosion is likely to take place more rapidly in soils containing limestone and other calcareous matter, or where cinders are present. It is more rapid in poorly drained soils than in places where the drainage is good.

Effect of Sheath Compositions. Both field and laboratory data indicate that tin-lead alloy sheath is much more resistant to corrosion than pure lead. Antimony-lead alloy on the other hand is less resistant to corrosion than is pure lead. This seems to be due to the fact that the corrosion starts in the intercrystalline spaces. The greater part of the antimony appears between the crystals while the greater part of the tin goes into a solid solution. Tin is naturally more resistant to corrosion and is so near to lead in the e.m.f series that very little local action is likely. Antimony lies further from lead in the e.m.f. series and more local action is likely.

Prevention of Corrosion. The only means of preventing corrosion is by separation of the cable sheath from the soil. In the construction using conduit this is done effectively by the clay duct, which accounts for the almost complete absence of corrosion. A limited experience with pitch or asphaltic coverings indicates that corrosion will be prevented if the covering can be complete and continuous. The use of concrete, limestone or untreated wood in direct contact or in the vicinity of the sheath should be avoided.

The Relation Between Tarnishing and Corrosion. By ULICK R. EVANS.*

Previous work has demonstrated the electrochemical character of many important processes of corrosion; the present paper describes investigations into the attack of gaseous sulphur dioxide on iron and zinc, and that of hydrogen sulphide on copper, with special reference to the part played by water in each case, and also to the essential difference between tarnishing and corrosion proper. Iron and zinc are unattacked by dry sulphur dioxide, but a very small amount of water vapor is sufficient to allow the action to proceed apace.

Dry copper exposed to hydrogen sulphide in the absence of liquid water assumes a series of tints, due to interference, suggesting the direct formation in situ of a sulphide-film, in optical contact with the metal. Moisture in very small amount merely simulates this action, but a film of liquid water, even though very thin and scarcely visible, causes a second type of change, giving rise to a less compact and often non-adherent layer of black or brown sulphide. The zonal phenomena observed in drops of hydrogen sulphide solution placed on copper surface recall those produced by drops of salt water on iron or copper, and suggest electrochemical action connected with differential aeration. Electric currents generated between two copper electrodes immersed in hydrogen sulphide solution subjected to differential aeration can actually be demonstrated. The blackening of wet copper by hydrogen sulphide tends to follow the grooves left by emery treatment, the places least accessible to oxygen.

If copper is exposed to moist hydrogen sulphide at a constant temperature, so as to avoid actual condensation of liquid water, the first type of attack may continue until interference tints of the fourth order are reached. The tints are best produced when the hydrogen sulphide is present in small amount, but tend in that case to appear at the bottom or edges of the specimen first, where diffusion proceeds most easily, spreading upward and inward in regular sequence. If, however, liquid water condenses on the specimen at a point to which hydrogen sulphide has still access, the second (electrochemical) type of corrosion is set up, and since the dark product is non-protective, action at that point proceeds apace.

*A paper presented at the Forty-sixth General Meeting of the American Electrochemical Society, held in Detroit, Mich., October 2, 3 and 4, 1924.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

BLACK DIP FOR BRASS

Q.—We would appreciate information relative to black finish on brass castings. We are planning on using this finish, if we can do so, to finish brass parts which we are, at the present time, nickel plating. Other concerns are finishing these parts in black enamel; however, we think that there may be a process that will permit us to finish them in black and get away from baked enamel and nickel plate.

A.—We do not believe that any black dip will give you a satisfactory black finish for your product that will wear as well as a black enamel. Furthermore, any black finish obtained by a chemical method upon the brass castings would have to be lacquered so that the operations would be almost identical. One of the best black immersion dips for brass can be prepared as follows:

Water	2 gallons
Water ammonia, 26°	1 quart
Carbonate of soda crystals	8 ozs.
Carbonate of copper, dry	16 ozs.

Temperature of solution, 120-140° F.

To prepare: dissolve the soda in the water, the copper in the ammonia and then mix thoroughly. The brass must be clean and bright for the best results, even if the results are not as may be desired. The black finish resulting will be very satisfactory as a base for one coat of enamel. This should be ample.—C. H. P., Problem 3,285.

BRIGHT BLUE ON STEEL

Q.—We enclose sample, and would appreciate it if you could let us know how to get this finish on articles.

A.—To produce a bright blue finish, same as sample submitted, upon steel, it is necessary to ball burnish the articles to a very high lustre as the finish is the factor in producing heat blues—per your sample.

When such a finish has been produced, then the articles, perfectly dry, should be immersed in a molten mixture of equal parts of sodium nitrate and sodium nitrite, heated in an iron kettle between 500 and 600° F. The articles should be placed in a perforated ladle so that a quantity can be blued at one time. As soon as a satisfactory blue results, the articles must be cooled in water, and then dried out in boiling water and hardwood sawdust. Potassium nitrate and nitrite can also be used to replace the sodium salts.—C. H. P., Problem 3,286.

CAST GUN PARTS

Q.—In your September issue, on page 352, the article by Edward D. Gleason I believe, hits the keynote to our business. Where is the foundry that will make us the best castings out of the untarnishable metal with the 135,000 lbs. tensile referred to by Mr. Gleason? We want them for gun parts.

A.—In view of the fact that the gun parts such as made by your company, and others, are so small, foundries in general would not care to make them, except at exorbitant prices, as it is a steel melting proposition. The Crucible Steel Company of America, Pittsburgh, Pa., makes a steel of like nature that can be purchased in bars, also chromium steel (chrome) which is stainless and can also be purchased in bars. Hence it would be preferable to have dies made, and have these gun parts drop-forged; as they can be made with an accuracy of a few thousandths and the tensile in hot rolled bars would run over 200,000 lbs.—E. D. G., Problem 3,287.

DULL BRUSH BRASS

Q.—How can I produce a dull brush brass finish?

A.—You cannot produce a dull brush brass finish on brass by chemical methods. You can, however, produce an Ormolu finish, which sometimes passes for a brush brass finish. The solution is prepared as follows:

In undiluted nitric acid, add lowly and at intervals, zinc oxide until the acid becomes of the consistency of thick white-wash. The clean brass articles should be immersed in this acid dip for a moment or two, agitating them during the immersion. Then remove, wash in water thoroughly and drain well. Now immerse the articles in a bright acid dip, prepared as follows, for a moment:

Nitric acid	1 gallon
Sulphuric acid	1 gallon
Water	1 quart

Remove; wash and dry and lacquer as usual. The acid bright dip should be kept cool by surrounding the receptacle with cold running water.—C. H. P., Problem 3,288.

Muriatic acid	2 ozs.

ETCHING STOP-OFF

Q.—I wish to make some etched lamp shades out of brass and copper sheets with design etched clear through and colored paper or silk placed underneath design to bring out effect. I would appreciate your favor, if you would give me a varnish that would stand the 3 to 1 water and acid etching solution.

Could I make a bath and lay sheet in solution to etch?

How about electro etching? Can I etch designs this way? If so please give me baths for copper and brass.

A.—Any air drying asphaltum varnish can be used as a stop off in etching operations.

In etching, it is necessary to protect the reverse side of the plate to be etched, otherwise it would be eaten away by the etching acid. It makes no difference whether you lay the plates horizontally or vertically in the etching solution, providing all surfaces to remain unetched are thoroughly protected.

Electro-etching gives rapid results with a dilute nitric acid solution. The plates to be etched become the anode. Use cathodes of sheet lead.

There have been many articles published in THE METAL INDUSTRY covering the etching of metals. An unusually good article was printed in April, 1909, page 132, entitled Etching Solutions for Brass and Copper by Emanuel Blassett.—C. H. P., Problem 3,289.

POROUS ALUMINUM CASTINGS

Q.—We are having trouble in getting solid aluminum castings. On some castings after they are machined they are very porous, resembling a cake of cheese and they have to be very close grain and solid. I was just wondering if your chemist could not advise us what scavenger or alloy to use to draw the impurities out of the metal before pouring or how to treat the metal. We are using a No. 12 alloy, 92% aluminum, 8% copper.

A.—We feel that your trouble is due to the temperature at which the aluminum is poured into the mold. It is important if the castings are ⅛ to 3/16 thick the aluminum should be kept under 1,350° Fahrenheit, and for heavy castings from 1,200° to 1,250° Fahrenheit. It is advisable not to overheat the aluminum in the furnace. When aluminum is poured hot in a mold of damp sand, it produces steam, which is absorbed and retained in the metal, making holes, or the steam is decomposed into hydrogen and oxygen and the oxygen unites with the aluminum to form an aluminum oxide and the hydrogen diffuses through the mass of metal.

Watch your melting practice and your difficulty will be overcome; also your molding sand. Use as dry as consistent for good practice.

To overcome bad melting practice use about 2% silicon in your hardener of 50 copper and 50 aluminum. In other words make a

hardener of 20 silicon, 30 copper, 50 aluminum. Pour into ingots and use 84 aluminum and 16 of hardener. This mixture will stand abuse in melting and should help you in overcoming your cheese-like castings.—W. J. R., Problem 3,290.

REPAIRING ALUMINUM

Q.—I would be very much pleased and thankful to you if you would direct me how to solder aluminum ware. I would like to do mending.

A.—The operation of soldering aluminum ware is not very practical as it is complicated by the facts that the high thermal conductivity of the metal renders local heating difficult, and that in order to have a solder of low melting point, it is impossible to use a solder of the same composition as the work, as in the case of welding.

Aluminum is highly electro-positive to such metals as have to be used, with the result that subsequent disintegration of the joint is very likely to take place.

Nevertheless, small jobs which are not exposed to moisture or liquids, or which can be protected by a coating of asphaltum, enamel or such similar means, can be successfully soldered. Cleanliness is an essential. For soft soldering it is usual to treat the surfaces to be soldered with weak hydrofluoric acid and wash the acid off before using the flux or applying same. Fluxes consist of stearic acid or tallow and tin chloride, and are melted onto the piece or joint to be soldered.—P. W. B., Problem 3,291.

STREAKY COPPER PLATE

Q.—I am writing to you for information about my copper tank. The copper cyanide solution has been in use about three months and has never acted right.

The solution was made up with copper cyanide and sodium cyanide which was purchased from a local drug store. The solution did fine for about three weeks. Then it refused to plate at all.

It was then built up with sodium cyanide but has never given good results. The plate sticks fine where it takes but the work comes out streaked especially on large pieces. Some parts of the surface look polished, some other parts are of a muddy color and then there will be streaks that do not plate at all. The Baume rises with use going up as high as 9.

A.—To remedy your copper solution, first add 2 ozs. bisulphite of soda per gallon. Then add 1 oz. of sodium cyanide per gallon. These additions should give you a satisfactory copper deposit. If the copper deposit is good but uneven, in color, then add to the solution 5 grains of hyposulphite of soda, or 1 oz. per 100 gallons. Your solution will surely give you satisfactory results.—C. H. P., Problem 3,292.

STRIPPING TIN AND LEAD

Q.—Could you kindly give me the formula for taking tin and lead off copper and brass?

A.—Both tin and lead are somewhat difficult to remove from copper and brass. You might try a solution of caustic soda 1 lb. per gallon of water, heated to 180-200° F. or possibly a dilute hot solution of hydrofluoric acid will give results. Try

Water	1 gallon
Hydrofluoric acid	1 pint

The following electro strip might also be tried out. The articles are made the anodes either sheet lead or copper can be used as the cathodes.

Water	1 gallon
Sulphuric acid	1 gallon
Water	1 pint
Glycerin	1 oz.

Voltage 4 to 6. Current—reversed as noted.—C. H. P., Problem 3,293.

SWEATING DROSS SAMPLES

Q.—The writer asks if you can advise him where to get the following information: How to sweat samples of lead, tin and solder dross so as to find out metal contents of same.

A.—To find the metal contents of solder dross take a sample of your dross. After mixing over the pile, so that it is uniform, say 50 lbs., mix with the dross 10 lbs. of coal dust, 2 lbs. of lime, 2 lbs. of fluorspar, place in a crucible, melt and pour into ingots. This will give you the metal contents of the dross. Then have an analysis made to get the lead, tin, and other metals in the amount recovered.—W. J., Problem 3,294.

TARNISHED BRASS PLATE

Q.—We have recently been having some trouble with some of our brass plated hardware turning after it has reached our customers, and we are sending you by parcel post today two samples showing the trouble we are having. We are handling the work the same as we have handled it for some time past, and for your information will say that only a small percentage turn out like these samples.

After the work is plated it has a bright rich color, and is tumbled in leather meal, then lacquered with a spray lacquer. We first attributed this trouble to the lacquer we were using, and have changed the lacquer, but continue to have the trouble. We figured that the trouble was in the plating, we have a larger percentage of the work turn out bad. Both of the samples we are sending you were handled in the same manner with all of the other work which was turned out on the same day. All of the other work is in good condition, but we have had this recurring at intervals for the past three months.

We have watched our compressing tank, and spraying parts, to see that no water gets mixed with the lacquer, and have tried everything that we can think of to overcome this trouble. If you can offer any suggestions, which you think will assist us in overcoming this trouble, we would greatly appreciate same.

A.—We have made a study of your peculiar difficulties in the tarnishing of some of your brass plated steel trunk hardware as per samples submitted. It is difficult without being present at your plant, to decide the true cause of the problem. Upon immersing the samples in a fairly concentrated sodium cyanide dip, the lacquer was softened so that after washing in cold water, it was possible to remove the lacquer in strips with the fingers. The peculiar tarnish was found to be under the lacquer; after the samples were again immersed in the cyanide dip it became dissolved, leaving a clear, bright, uniform brass color. We have come to two decisions in the matter; the first, is that contact with the paper you use in lining the barrels used in shipping the product, when slightly damp (due to humid action of the summer weather upon the paper), may cause the tarnishing, due to chemical action of the sulphites contained in the paper, and the direct contact of the brass plated parts with the paper.

The remedy in such a case would be to use either waxed or oiled paper for the lining of the barrels instead of ordinary wrapping paper. The second decision is based upon impurities in the rinse waters; both cold and hot, that produce the tarnishing which apparently reacts to a greater extent beneath the lacquer.

Such results would occur mostly on a Monday morning, after the water had been inactive in the cold water and steam pipes. Such waters contain an iron salt in some form which induces tarnishing until the water is freed from the iron salt, both in the cold and hot water rinsing tank.

This is a condition we found at the plant of a manufacturer of trunk hardware. A product such as yours was nickel plated for a few moments first, then brass plated in a bright brass solution; rinsed in cold and boiling waters and lacquered direct with a water dip lacquer. Staining resulted to a more or less degree, such as you experience. It was traced to the hot rinse water from our investigations, which proved to be correct. The method used to overcome the trouble was to place 2 large sized slabs of zinc metal in the hot water tank and every Monday morning to add ½ oz. acetic or phosphoric acid to each gallon of hot water contained in the tank. An evolution of hydrogen was thus brought about which prevented the formation of oxides, preventing staining by noon-time on Monday. The conditions of the water became normal and no more acid was required until the following Monday. The slabs of zinc were, however, kept in the hot water continuously, the rust forming upon the zinc similar to the tarnish, which was occasionally removed by scouring with pumice stone. As soon as cold weather approached the trouble no longer developed. We suggest that you repeat what we did at this plant, and feel sure your problem will be solved.—C. H. P., Problem 3,295.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,506,772. September 2, 1924. **Die-Casting Metal.** Charles Pack, Elmhurst, N. Y., assignor to Doehler Die-casting Company, a corporation of New York.

The method consisting in mixing a small quantity of chromium and nickel in molten zinc together with a suitable flux.

1,506,971. September 2, 1924. **Tube and Method of Making Tubes.** Harry W. Bundy, Detroit, Mich.

A tube, comprising metal strip stock longitudinally drawn and fashioned into a plural-ply hollow cross-section having a longitudinally running seam, the piles being united by a high fusing point metal material electro-deposited on the surfaces of the ply stock.

1,507,340. September 2, 1924. **Method of Treating Copper.** Robert J. Cunningham and George H. King, Salt Lake City, Utah.

The method of treating copper, which consists in melting commercial copper to form a molten bath, covering the surface of the bath with salt (NaCl), after the copper has set but before it has cooled removing the excess salt and the impurities from the surface of the copper.

1,507,836. September 9, 1924. **Polishing Wheel.** Clarence R. King, Worcester, Mass., assignor to Norton Company, Worcester, Mass.

An abrasive article comprising a resilient cushioning body and spaced teeth of bonded abrasive grains united therewith.

1,508,031. September 9, 1924. **Foundry-Sand Mixer.** Herbert S. Simpson, Chicago, Ill.

In a mixing machine, a pan having a central opening surrounded by an annular flange, a turret having an annular base flange seated upon said first mentioned flange, a shaft journalled in said turret, a spider secured upon the upper end of said shaft, a pair of vertically adjustable mullers supported upon opposite sides of said spider, and segmental-shaped wear plates on the bottom of said pan adapted to be removed through a vertical adjustment of said mullers.

1,508,241. September 9, 1924. **Metal and Its Manufacture.** Aladar Pacz, Cleveland, Ohio, assignor to General Electric Company, a Corporation of New York.

The method of producing substantially non-sagging and non-offsetting tungsten filaments which includes producing an intimate mixture of finely divided tungsten and a compound or compounds containing oxide of tantalum or niobium or both and thereafter sintering a compacted body of said mixture.

1,508,243. September 9, 1924. **Treatment of Refined Copper From Copper Oxide.** Walter George Perkins and Walter Henry Beasley, London, England, assignors to Metals Production Company of North America, Incorporated, New York, N. Y.

In a process for the treatment of finely divided oxidized copper-containing material, the steps comprising first heating the material in a reducing atmosphere so as to produce subdivided metallic copper, then cooling the copper in a reducing atmosphere and subsequently minimizing the exposed surface by pressing the material into blocks.

1,508,556. September 16, 1924. **Making Castings of Aluminum Alloys.** Zay Jeffries, Cleveland Heights, and Robert S. Archer, East Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

In the art of making aluminum alloy castings, the method comprising heating an alloy casting containing a substantial amount of silicon, to a temperature slightly below the melting point of the eutectic, and maintaining such temperature until the silicon particles have been sufficiently altered in shape to materially improve the physical properties of the cast alloy.

1,508,557. September 16, 1924. **Method for Producing Chromium or Alloys of Chromium.** Bo Michael Sture Kalling and Sven Dagobert Daniel Trollhattan, Sweden, assignors to Aktiebolaget Ferrolegeringar, Stockholm, Sweden, a Joint Stock Company Limited.

The process of producing chromium alloys having a low content of carbon and silicon, which consists in subjecting a chromium alloy rich in silicon, at a temerature above the melting point of the alloy, to the oxidizing action of free oxygen in a bessemerizing process, thereby to desilicate the charge, and adding to said charge during the early stage of desilication a slag obtained from a similar charge at a later stage.

1,508,889. September 16, 1924. **Method of and Apparatus for Making Castings.** John Kralund and Clarence H. Duckworth, Brooklyn, N. Y., and Marcus Stern, Toledo, Ohio, assignors to Doehler Die Castings Company, Brooklyn, N. Y.

In casting apparatus, the combination of a mold having two separable sections defining a mold cavity and a gate opening in one of said sections, and a metallic pin mounted on the other section and adapted when said sections are together to extend centrally into said opening and to provide a core for metal remaining in said opening to shrink upon when cooling, so as to prevent the metal in said opening from so adhering to the walls of said opening as to become broken from a casting in said cavity when the sections are separated, said pin having a roughened surface to effect a more positive adhesion of cooling gate metal thereto.

1,509,227. September 23, 1924. **Process of Making a Lead-Alkali-Metal Alloy.** William S. Calcott, Penns Grove, N. J., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del.

The process of making an alloy of lead and an alkali-metal, which comprises heating the two metals together to form a molten mass, and excluding oxygen therefrom by maintaining over the upper surface of the molten alloy a liquid layer of a substance which will not contaminate said alloy, and which has a boiling point above, and a melting point substantially below, the temperature of said molten alloy.

1,509,277. September 23, 1924. **Non-Ferrous Melting Furnace.** Conrad Werra, Waukesha, Wis.

A melting furnace, comprising a chamber, a melting pot positioned entirely within the chamber and having horizontal extension portions provided with charging and discharging openings extending outwardly through said chamber, and means for supplying heat to said chamber and to approximately all sides, top and bottom portions of the melting pot.

1,509,458. September 23, 1924. **Die-Casting Machine.** Ruben H. Williams, Flint, Mich.

In a casting machine, a supporting frame, a stationary mold section arranged thereon, a reciprocatory mold section mounted for movement toward and away from the stationary mold section, a stationary guide mounted upon lower end of the wire mesh screen being provided with a horizontally disposed stiffening rod, latching means carried adjacent the lower end of the window opening for engaging and holding the reinforcing rod, channel guides adjacent the opposite sides of the window opening, said guides comprising angularly shaped bars secured to a support adjacent the inner side of the roller, an outwardly extending flange carried by said bars, said roller having bearings in said outwardly extending flanges, the outer ends of said outwardly extending flanges being bent upon themselves to form channels in vertical alignment with the outer side of the roller, the upper outer side of said channels being provided with upwardly and outwardly extending integral guide lugs, and relatively close headed members carried by the sides of the wire mesh screen and having their heads disposed in the channeled members, said wire mesh screen being held against bulging inwardly incident to air pressure as the vehicle moves forwardly and the wire mesh allowing the passage of air through the screen and excluding matter.

1,509,534. September 23, 1924. **Electroplating Machine.** Guerin Todd, Millburn, N. J., assignor to The Hanson & Van Winkle Company, Millburn, N. J.

An electroplating machine, comprising in combination, a vat, a rotatable cylindrical container suspended in the vat, said container having heads and an interior and an exterior perforated drum, an anode bar within the inner drum and cathode terminals supported entirely from the head and extending into the annular space between the drums free of contact with the perforated drums, and also extending through the head and a conducting plate outside the head to which said cathode terminals are secured.

Equipment

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

RECUPERATOR FURNACES

The Hermansen Recuperator Brass Melting Furnace made by the Combustion Engineering Corporation, of New York, consists of a pit or melting chamber in which the crucibles are set. Instead, however, of burning coal directly on a grate and allowing the combustion gases to go direct to a stack after heating the crucibles, the coal is burned in a gas producer which is built integral with the furnace, and the gas produced is burned in the pit or combustion chamber. The gases leaving the combustion chamber instead of going direct to the stack are led through a

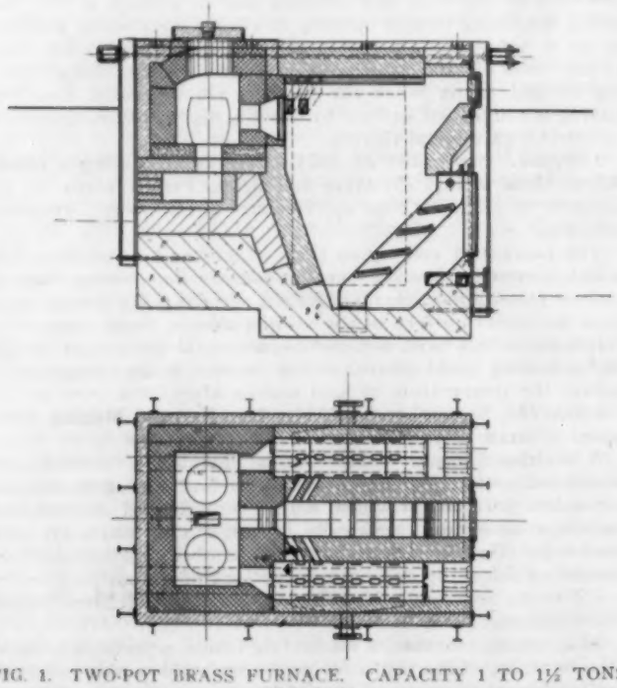


FIG. 1. TWO-POT BRASS FURNACE. CAPACITY 1 TO 1½ TONS PER DAY

series of Hermansen Recuperative tile, so designed that incoming air is allowed to follow in an opposite and transverse direction in separate passages, and in this way 40 to 60% of the heat of the waste gas is absorbed by the incoming air. This preheated air is lead by ducts to the burner and there mixed with the gas from the producer and burned. Operating advantages claimed by the manufacturers are as follows:

(1) The fuel cost is greatly reduced over other methods. A production of from 5 to 6 tons of brass melted per ton of coal burned is secured. The preheated air improves combustion and produces a higher flame temperature.

(2) Labor costs are lower. More thorough combustion and higher flame temperature melt the brass and other non-ferrous metals more quickly. Five to six heats per 8 hour shift are obtained with this type of furnace.

(3) Evaporation and oxidation losses are greatly reduced.

(4) Labor of firing the coal is greatly reduced.

(5) Life of the crucibles is increased. Improved combustion, due to less excess air reduces oxidation of the crucibles. Eighty to one hundred heats per crucible are obtained under ordinary operating conditions.

(6) Brass and other metals may be melted in small units giving great flexibility in the operation of the furnace, ease in stirring and skimming, thus resulting in the high grade of metal for which crucible furnaces are noted.

(7) Many different alloys can be melted in crucibles without danger of contamination from previous charges as compared with open flame or electric furnaces using a hearth.

Hermansen Recuperators are constructed of special refractory blocks which have a square bore extending from end to end and top and bottom open transverse channels. Rows of several such standard blocks are laid end to end and side to side forming several adjacent ducts lengthwise of the furnace which serve as flues for the waste gases. Rows are laid on top of the first and the transverse channels in the lower surface in combination with those on the upper surface of the first rows form flues for the secondary

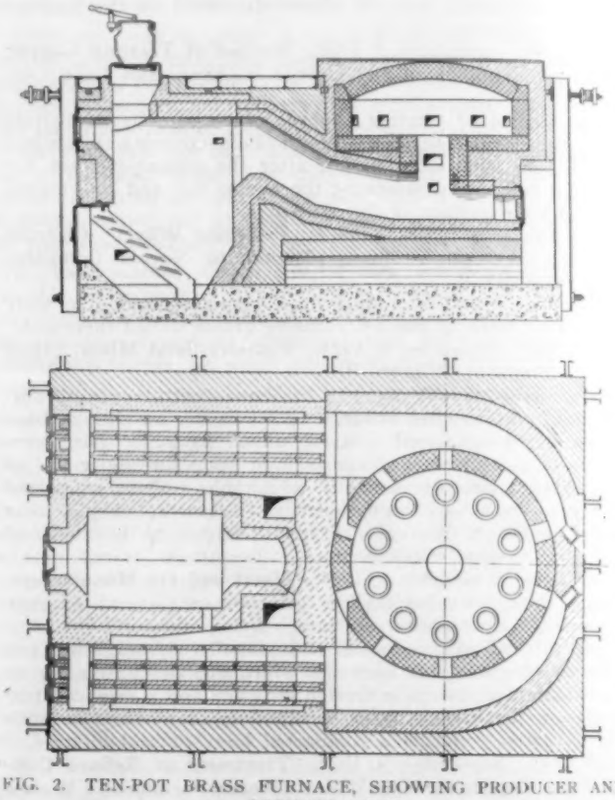


FIG. 2. TEN-POT BRASS FURNACE, SHOWING PRODUCER AND RECUPERATORS

air. The ends are flanged and mortised to insure continuous tight joints, and equipped with access doors for cleaning the gas flues.

The Combustion Engineering Corporation is prepared to furnish the recuperative type of furnace for burning oil as well as coal in sizes ranging from 2 to 12 pots.

EVERBRITE METAL

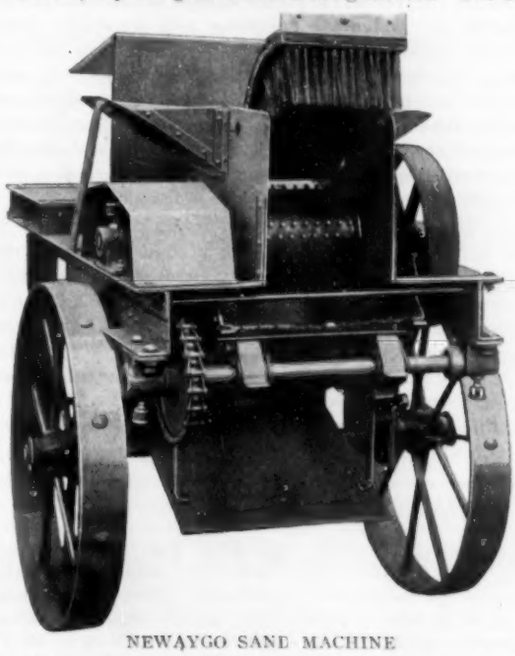
The Curtiss Bay Copper & Iron Works, Baltimore, Md., has placed on the market a new metal called "Everbrite," a synthetic alloy of the cupro-nickel type. It is claimed to be positively non-rusting; to resist corrosion, erosion, and abrasion; to have a strength exceeded only by that of heat-treated steel and to have an elastic limit as high, at 1,000° F. as at room temperature. It is made in two forms, the No. 92 for rods, forgings and fabricated shapes, and the No. 82 for casting. A number of interesting products have been made of the Everbrite No. 82, such as golf heads, valve spools weighing 175 pounds and valve seat rings 18 inches in diameter. The metal can be melted in crucibles and the practice is the same as with brass, except of course, that a higher temperature is required. In molding it is desirable to arrange the gates, risers and vents in such a way that the air cleared out of the mold ahead of the metal. Large gates and risers should be used, and the mold be well vented. Number 1. Albany sand can be used, opened and strengthened with a medium Lumberton.

SAND MACHINE

The Newaygo Sand Machine, a new development in connection with proper sand preparation, is now being marketed by the National Engineering Company, of Chicago, Illinois, who are manufacturers of the Simpson Sand Mixer. The Newaygo Sand Machine aerates and riddles foundry sand in one operation. It is said to have a marked advantage over the riddle inasmuch as the aerated sand is more readily screened, and lumps that ordinarily will not pass through a riddle are disintegrated and fluffed up which eliminates the loss of new sand. The manufacturers state that this machine produces sand fluffy in texture with the highest moldable quality.

It is made in six styles. The No. 1 portable machine, shown in cut, consists of a feed hopper containing coarse screen for eliminating gaggers, wedges, or large pieces of scrap, aerator roll, and fine screen for the final riddling of the sand. This machine can be easily moved around the foundry. The No. 2 portable machine is for use in connection with the Simpson Mixer or other sand mixing machines, for aerating facing or core sand. The No. 3 size has a much larger capacity and consists of an elevator boot and bucket elevator which carries the sand to the aerator roll, after which it is screened and dropped into a storage hopper for distribution through the foundry. The No. 4 and No. 5 are aerators furnished with or without screen, for use in connection with sand handling systems. The No. 6 is a small aerator only. It is made to fit the discharge spout of the Simpson Mixer, and is operated from the mixer shaft. It can be attached to any Simpson Mixer now in operation.

The principle of the aerator roll on the Newaygo Sand Machine is simply a pegged cylinder revolving against an opposing wire brush. This cylinder is cast iron with holes drilled in it and flat head hardened rivets inserted in these holes, held in place by a backing plate. These rivets can readily be replaced at very little expense when worn out. The wire brush opposing this roll is made in four sections, and under steady use will last from two to four months, depending on the sand being aerated. The brushes



NEWAYGO SAND MACHINE

can be changed in approximately ten minutes' time, at very low expense.

SAND BLAST EQUIPMENT

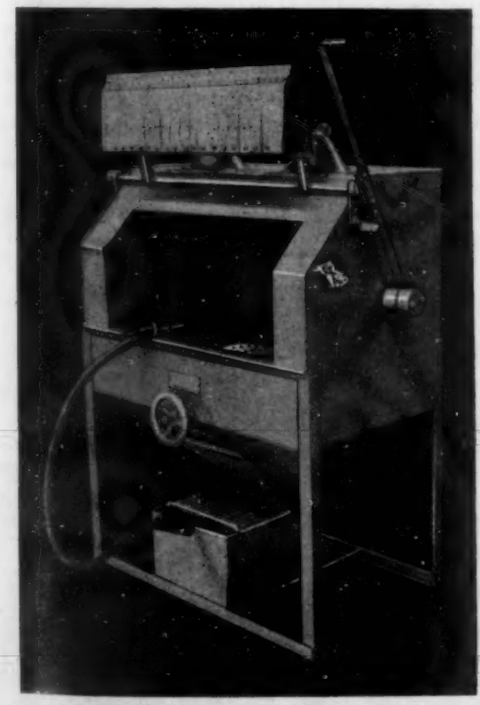
An interesting line of sand-blast equipment is being made by the Ruemelin Manufacturing Company of Minneapolis, Minn. This concern makes a number of different types of equipment useful for all sorts of conditions, varying from small installations up. A few of its items are as follows:

Midget sand-blast gun.

Operator's sand-blast helmet.

Sand-blast generator (direct pressure).

"Pipe" adapter sand blast nozzle—a new type of nozzle which is renewed, upon wearing out, by inserting a short length of ordinary piping.



RUEMELIN SQUARE SAND BLAST CABINET

Square shooter sand-blast curtain for sanitary precautions in sand-blasting large work.

Zig-zag sand-sifter.

Tilting tumbling barrel.

Band friction clutch.

Exhaust fans of various types.

Dust arresters of various types.

Square sand-blast cabinet—an interesting cabinet for work which will go into space 30 inches by 48 inches. It is also possible to use a revolving table attachment with this cabinet which can be rotated by a hand wheel.

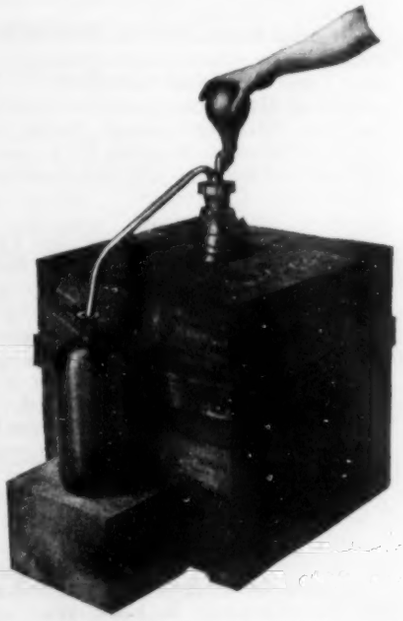
Midget sanitary sand-blast—a revolving table either 40 inches or 60 inches in diameter. It can be loaded by raising the hood and swinging to the side, thus exposing the entire table. The rotating is done by means of a hand wheel.

THOMPSON ACID PUMP

The Crown Rheostat & Supply Company, 1910 West Park avenue, Chicago, Ill., is placing on the market a new acid pump for use in transferring acid from a carboy to a flask or bottle. It is claimed to be a safe and rapid method, avoiding the inconvenience of handling the carboy. The operation is as follows:

Pressing the bulb a few times starts an even, steady flow of acid — no splashing. Touching the valve stops the flow. The bottom end of the lead pipe is to be bent to reach the lowest point in the carboy near the side, thus getting all of the acid.

The outlet pipe is of lead; can be bent to suit convenience. There are no glass parts to break or cause injury to workmen or damage to property. The lower end of pipe in the carboy serves as a gauge.

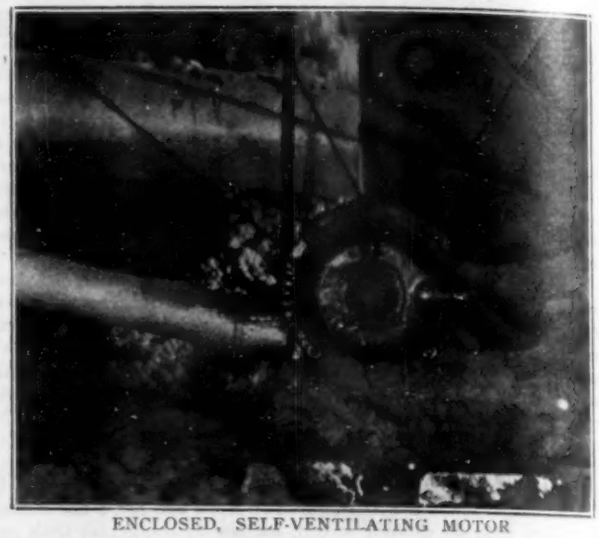


THOMPSON ACID PUMP

ENCLOSED SELF-VENTILATING MOTORS

American Electric Motors, Inc., of Milwaukee, Wis., are placing on the market an electric enclosed ball-bearing self-ventilated polyphase induction motor, which should be of considerable use in metal polishing and finishing shops. The complete enclosure of the motor accomplishes the protection against the deteriorating effects of dust, gas, oil, and water. The flash from any momentary overload is confined within the housing, thus eliminating fire hazard from dust explosion. It is claimed that with a source of clean cool air supplied to it through ordinary galvanized iron ducts, the motor is entirely independent of the local atmospheric conditions.

It is stated that the enclosed motors have been operated under a pile of shavings as well as under normal conditions. Metal chips, turnings and shavings cannot get into the moving parts and are, therefore, harmless. The motor is recommended strongly for work in screw machine shops, general machine shops, polishing, and buffing installations. A statement from the Mutual Fire Prevention Bureau of Chicago recommends these motors wherever dust is prevalent, and the Federal Malleable Company of West Allis, Wis., praises the work of this motor in its sand-blast department.



ENCLOSED, SELF-VENTILATING MOTOR

SPUN ALUMINUM BALL

Frank Joseph Stolitzka, Box 64A, East Market Street Ext., Akron, Ohio, has succeeded in spinning a perfect ball of aluminum, for use in the making of toy balloons. Heretofore balloons have been made on painted wooden balls and the least little defect means an imperfect balloon. The aluminum ball does away with the defects. Stolitzka made chandeliers in Vienna before he came to America. In the United States he became known as an expert spinner.

Two years ago he received an order from a rubber company for an aluminum form. He experimented one year until he had the perfect ball spun from one piece of sheet aluminum. Through it he lost his home but still has his spinning shop and could produce the aluminum forms on a large scale quickly.

The aluminum form far exceeds any form as yet on the market, because of its lightness, and the need for less glycerine. It is lasting and non-porous. Acid does not affect it; it needs no sandpapering or shellacing; keeps the liquid rubber cement clean and a smooth rubber toy balloon is the result.

EQUIPMENT AND SUPPLY CATALOGS

Metal Cleaner—A folder describing Roylie Cleaner manufactured by the Hanson & Van Winkle Company, Newark, N. J.

Tumbling Barrel—A folder describing the Crown Tumbling Barrel manufactured by the Crown Rheostat & Supply Company, Chicago, Ill.

Grinding Wheels—A booklet from the Norton Company, Worcester, Mass., advising about the factors affecting grinding wheel selection.

Polishing Lathes—A folder on Crown ball bearing polishing and buffing lathes made by the Crown Rheotat & Supply Company, Chicago, Ill.

Welding Electrodes—Booklet Y-2019, issued by the General Electric Company, Schenectady, N. Y., descriping the new Type-A welding electrodes.

Plating Dynamos—A folder explaining the advantages of Interpole Dynamos manufactured by the Hanson & Van Winkle Company, Newark, N. J.

Electric Furnace—A folder from the Ajax Electro-thermic Corporation, Trenton, N. J., on various applications of Ajax-Northrup high frequency furnaces.

Metal Cyanides—A booklet from Crown Rheostat & Supply Company, Chicago, Ill., describing Aero Brand sodium cyanide and metal cyanides for electro-plating.

Sand Blasting—A catalog issued by the United States Silica Company, Chicago, Ill., discussing abrasives and their use, and comparing flint shot with steel shot.

Electric Screw Driver—Bulletin No. 605 from the Hisey-Wolf Machine Company, Cincinnati, Ohio, describing the new Hisey Friction Head Electric Screw Driver.

Metal Stools—A new design of trianguler stool with Sani Metal, described and illustrated in a folder from the Northwestern Furniture Company, Milwaukee, Wis.

Shop Barrels—A folder from the Detroit Range, Boiler & Steel Barrel Company, Detroit, Mich., describing its steel barrels for handling and transporting in the shop.

Cylinder Grinding—An illustrated folder from the Gisholt Machine Company, Madison, Wis., on the Du-All grinder, a portable cylinder grinder and piston fitting machine.

Plating and Polishing Supplies—An illustrated card from W. Green Electric Company, New York, showing its general equipment and prepared salts for plating and polishing.

University Research—Circular No. 1, issued by the Lehigh University of Bethlehem, Pa., explaining the organization and functions of the Institute of Research of Lehigh University.

Babbitt—A booklet entitled "Babbitt Facts" issued by the Ajax Metal Company, Philadelphia, Pa., containing facts of interest to babbitt users and hints regarding choice of babbitt.

Rust Proofing—Jordan Process, a rust-proof finish for iron and steel operated by the Metal Penetrating Color Corporation, New York. The folder explains the operations required and estimates costs.

Resistor Units—Bulletin entitled "CR-9006 Enameled Resistor Units," issued by the General Electric Company, Schenectady, N. Y., describing these units and giving standard ratings and dimensions.

Chemicals and Anodes—A folder from the Hanson & Van Winkle Company, Newark, N. J., stating that it can furnish cyanides of copper and zinc, anodes and all chemicals used in nickel, copper, brass and zinc plating.

Automatic Rotary Furnaces—Bulletin No. 261, issued by the W. S. Rockwell Company, New York, covering Rockwell Automatic Rotary Furnaces and quenching, coating and coloring tanks for continuous heating, quenching and processing.

Rolling Mill Equipment—An attractive and interesting booklet issued by the Mackintosh-Hemphill Company, Pittsburgh, Pa., describing its work over a period of 120 years in manufacturing equipment for rolling mills, operating on both steel and metal.

NATIONAL SAFETY COUNCIL CALENDAR

The National Safety Council, 168 N. Michigan avenue, Chicago, Ill., has published an unusually elaborate and attractive calendar which can be obtained at a nominal price. Each sheet includes three months in addition to an original illustration, pointing to the value and desirability of carefulness and precautions for safety. The National Safety Council has surpassed all of its earlier productions and the calendar besides being attractive, performs a really useful function.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY

PHILADELPHIA BRANCH

Headquarters, Care of George Gehling, 5801 Edmund St.

The regular monthly meeting of the Philadelphia branch was held on Friday, Oct. 3, 1924, at the Harrison Laboratory, University of Pennsylvania, President Gehling in the chair, and a large number of members present, which was very gratifying to the Board of Managers. It shows the members' appreciation of the efforts made by the officers to make the meetings interesting.

Three new members were elected to active membership. The Secretary reported the sad news of the sudden death of Brother Member Wm. Asimus, at Rome, N. Y. Several letters of firms were read asking to be put in touch with platers, but as Philadelphia members are all busy, the letters had to be passed over to other branches.

The Banquet committee reported the arrangements of the greatest and best Meeting and Banquet, which will be held on Saturday, November 22, 1924, at Mosebach's Hall, 1241 Girard avenue. Exhibits will be shown and papers will be read by leading authorities on plating and finishing. They have also arranged a good entertainment for the ladies, with plenty of prizes and souvenirs. Tickets will cost $3.

The Chemical Instructor showed the members the value of a standard solution and also the care which must be used in handling these solutions in order to preserve their accuracy.

At the next meeting on November 7th, each member will be given an opportunity to make a titration of his own and it is hoped that all the members will take advantage of this opportunity.

DON'T FORGET THE BANQUET. Meet all your friends from out of town, as they are all sure to be there.

AMERICAN CHEMICAL SOCIETY

Headquarters, Washington, D. C.

At the Baltimore meeting of the American Chemical Society which will be held during Easter week in 1925, the Division of Industrial and Engineering Chemistry will hold a symposium on Corrosion. At the present time the tentative outline of the symposium is as follows:

1. Submerged Corrosion of Metals.
   a. Iron and Steel.
   b. Non-ferrous Metals.
2. Atmospheric Corrosion.
3. Corrosion of Special Alloys.

It is hoped that the scope of the papers of this symposium will cover the problems of corrosion in the heavy chemical industry, in the special chemical industry, in the marine world, in ordnance equipment, in the oil industry, mining industry, etc. Papers relating to any of these subjects or subdivisions will be welcomed by the chairman of the symposium, who is Robert J. McKay.

In case one plans to present a paper before this symposium he should correspond at once with Mr. McKay or the secretary of the Division, Erle M. Billings, care of Eastman Kodak Company, Rochester, N. Y.

NATIONAL SAFETY COUNCIL

Headquarters, 168 N. Michigan Avenue, Chicao, Ill.

National problems of accident prevention in America affecting the industries, railroads, mines, the schools, the homes and the general public were given close study at the seventy-five sessions of the Thirteenth Annual Safety Congress of the National Safety Council held at Louisville, Ky., September 29 to October 3, 1924. Approximately 3,500 were in attendance, including representatives from Canada, Alaska and other distant parts. Of particular interest were the crowded public safety sessions held at the latter end of the Congress. Every meeting was excellently attended. While possibly not the biggest safety Congress, it was the unanimous judgment that this year's convention from the standpoint of actual benefit to the safety movement was the best ever held. Louisville industries and civic organizations co-operated wholeheartedly in making the Safety Education Week and the Safety Congress a success.

Carl B. Auel, of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., was elected president of the National Safety Council to succeed Lewis A. DeBlois, of Wilmington, Del. Mr. Auel was previously vice-president in charge of general activities and has for years been actively identified with the accident prevention work of his own company and with the safety movement at large. Mr. DeBlois becomes vice-president in charge of general activities.

BRITISH INSTITUTE OF METALS

Headquarters, 36 Victoria Street, Westminster, London, England.

The Institute of Metals program for the session 1924-25, which commences on October 1, has just been issued. It covers not only the work of the parent institute, but of its six branches located in the various metallurgical centers. Over thirty important lectures dealing with various phases of non-ferrous metallurgy are enumerated in the program, including the annual May Lecture by the distinguished Dutch scientist, Professor H. A. Lorentz. Copies of the program can be obtained from G. Shaw Scott, 35-38 Victoria street, Westminster, London, England.

OHIO STATE FOUNDRYMEN'S ASSOCIATION

Headquarters, 5713 Euclid Avenue, Cleveland, Ohio

The Ohio State Foundrymen's Association is made up of approximately two hundred foundry operators, representing well over seventy per cent of the metal poured in the State in all branches of the industry, including metal, malleable steel and grey iron foundries. Bulletins published contain subjects of interest to foundry executives. Those interested are requested to communicate with the secretary at the above address.

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

The executive committee of the American Society for Testing Materials at its recent quarterly meeting decided to hold the twenty-eighth annual meeting of the Society at Atlantic City, N. J., June 22-26, 1925, with headquarters at the Chalfonte-Haddon Hall Hotels.

ORNAMENTAL BRONZE MANUFACTURERS

Headquarters, The Hollenden Hotel, Cleveland, Ohio

Ways of getting the public to use more ornamental metal in erecting business buildings and dwellings were discussed when the National Association of Ornamental Iron and Bronze Manufacturers opened its convention in The Hollenden October 22, 1924. About 250 attended.

Convention arrangements were made by a committee consisting of William F. Hammer, president of the Acme Fence & Iron Company; Ray A. Godfrey of the Consolidated Iron & Steel Manufacturing Company, and Thomas Griffith of the W. S. Tyler Company. F. H. Howe of Columbus, Ohio, is president of the association.

F. H. Howe was re-elected president; R. P. Lipheart, vice-president; Charles Waltz, commissioner.

Personals

L. W. OLSON

L. W. Olson, the newly elected president of the American Foundrymen's Association, has for a number of years been one of the prominent figures in the metal trades. He was born in Manitowoc, Wis., in 1878, and educated in the public schools of that city. In 1899 he was graduated from the University of Wisconsin, having taken his degree in engineering.

For the next three years he was engaged in electric railway and power plant construction work. In 1902 he took a position with the Ohio Brass Company, in Mansfield, Ohio, as a draftsman in the engineering department. He worked for a time as sales engineer, and in 1907 was placed in charge of the entire plant and manufacturing operations, with the title of Superintendent. This title was later changed to Factory Manager, and Mr. Olson still holds this position.

L. W. OLSON

Mr. Olson was one of the organizers of the American Brass Founders' Association, which was later changed to the Institute of Metals and served two terms as president of that organization in the years 1912 and 1913. He is a member of the American Society of Mechanical Engineers. He has served on the Committee engaged in cost standardization work for the Valve and Fittings' Manufacturers' Association and the Electrical Manufacturers' Association. During the last five years he has done considerable work on industrial relations.

At the present time, Mr. Olson is holding besides his position as Factory Manager of the Ohio Brass Company and the presidency of the American Foundrymen's Association, a number of other positions of interest and importance. He is president of the Mansfield Manufacturers' Club; chairman of the Committee on Industrial Education of the National Founders' Association and vice-president of the Hughes-Keenan Company, of Mansfield, Ohio.

Charles H. Buchanan, of Hinsdale, Mass., is now with the Hanson & Van Winkle Company, Newark, N. J.

H. E. Robertson is now vice-president and treasurer of the Goetz Brass Company, 630 N. Franklin Street, Chicago, Ill., having formerly been general manager of the Larco Wrench & Manufacturing Corporation.

Howard J. Wittman, 632 Nasby Building, Toledo, Ohio, has been appointed district representative of the **Kuhlman Electric Company** of Bay City, Mich. Mr. Wittman will have northwestern Ohio as his territory.

Louis Graue has resigned from the Magnuson Products Corporation, returning to the field force of the Magnus Chemical Company. He has charge of the Poughkeepsie section, which he had charge of before leaving this company.

A. J. Burrows has resigned as general foreman of the General Phonograph Company, Elyria, Ohio, and accepted a position as general foreman of the plating departments for the National Casket Company, Pittsburgh, Pa.

H. W. Hardinge, president of the Hardinge Company, Inc., New York, recently returned from Europe, after absence of four months on foreign business for the company. He sailed again September 27 for England and the Continent on company business.

J. W. Blackford has joined the Torrington Company, Torrington, Conn., and will handle sales of the Dayton swager and Torrington ball-bearing. He was formerly assistant to the president of the Consolidated Machine Tool Corporation, Rochester, N. Y., having held the same position previously with the Dale Machinery Company, New York.

Edward Drake, of Bristol, Conn., succeeds the late **Frank P. Welton** as representative for the Jonathan Bartley Crucible Company. He is an ex-boss caster of Waterbury Brass Company, Detroit Brass Company, Baltimore Tube Company, and Bristol Brass Company.

Charles Hayden, of Hayden, Stone & Company, New York, heads as volunteer Roll Call chairman, a special Mining, Smelting and Non-Ferrous Metals group to enlist the maximum response through the metallurgy interests of New York City to the annual Red Cross Roll Call opening November 11, Armistice Day, for funds to maintain the organization's relief work and public health program.

H. M. Broaddus, Niagara Falls, N. Y., has accepted a position as salesman with the General Abrasive Company, manufacturers of artificial aluminous abrasives. Mr. Broaddus has been connected in the abrasive industry for many years in various selling capacities, he having held a position with the Carborundum Company for several years selling its products in the southern states. More recently he was connected with the Cortland Grinding Wheel Company, representing this firm in Ohio.

Walter A. Graue, who has recently resigned from the Magnuson Products Corporation has rejoined the Magnus Chemical Company. For a number of years Walter Graue had charge of the Connecticut territory. He is well known in the plating trade, having given a talk about Cleaners before the Bridgeport & Waterbury-Hartford branches of the A. E. S. on two different occasions.

An appointment of interest to metallurgists is that of **F. C. A. H. Lantsberry** as managing director of **William Jessop & Sons Limited,** the well known steel manufacturers of Sheffield, England. Mr. Lantsberry, though his professional activities have been mainly in regard to steel, has shown a great interest in metal research. He received his early training with the British Westinghouse Company, at Trafford Park, Manchester. For nine years he was chief of the works and research laboratory of the Birmingham Small Arms Company's Laboratory. Later Mr. Lantsberry was transferred to Sheffield where he served for some years, first as works manager and afterwards as general manager. During his stay in Birmingham he was a frequent contributor at the meetings of the Local Section of the Institute of Metals and the Birmingham Metallurgical Society, and each of these bodies in turn elected him to its presidential chair. For three years he was engaged in metallurgical work at the National Physical Laboratory, Teddington. He is the joint author with Dr. Rosenhain of the Ninth Report to the Alloys Research Committee of the Institution of Mechanical Engineer.

Deaths

JOSEPH E. ELLISON

Joseph E. Ellison died at his home in Jamestown, N. Y., October 11, aged 49 years. He was chief metallurgist and a director in the Ellison Brass Manufacturing Company, Falconer, N. Y. In 1915 Mr. Ellison, with his brothers, founded the Ellison Brass Company, and later formed the Ellison Bronze Manufacturing Company.

HENRY ROBINSON TOWNE

Henry Robinson Towne, chairman of the board and one of the founders of the Yale & Towne Manufacturing Company, lock manufacturers, and for five years president of the Merchants' Association of New York, died October 15, 1924, at his home, 420 Park avenue. He was eighty years old.

Mr. Towne was born August 28, 1844, at Philadelphia, the son of the late John Henry Towne, a prominent engineer, whose name is associated with the Towne Scientific School of the University of Pennsylvania. He attended private schools in Philadelphia and entered the University of Pennsylvania, which he left before graduation and from which he later received the degree of A. B.

HENRY ROBINSON TOWNE

His engineering training was acquired at the Port Richmond Iron Works and the shops of William Sellers & Co., Philadelphia, and included also a tour of engineering establishments in England, France and Belgium, a course at the Sorbonne, Paris, and special studies under the late Robert Briggs, a civil engineer.

He married Cora E. White, the daughter of John P. White, in Philadelphia, March 12, 1868, and was the father of two sons, John H. Towne, a director of the Yale & Towne Manufacturing Company, and the late Frederick Tallmadge Towne, who died in 1908 while general superintendent of the company's principal plant, at Stamford, Conn. Mrs. Henry R. Towne died in 1917.

Just two months after Mr. Towne had formed his partnership with Linus Yale, Jr. (October, 1869), the latter died, and shortly afterward Mr. Towne succeeded to the presidency of the corporation. A factory was completed in Stamford and business was started with thirty employees. For a year or two its growth was slow, but under Mr. Towne's guidance work was started that ultimately expanded the factory into one of the largest of its kind in the world, covering more than twenty acres and capable of employing 5,000 workmen. Mr. Towne also introduced the time lock for bank vaults, which enabled a vault to be locked so that it could not be opened before a specified time.

In 1915, he retired to become chairman of the board and was succeeded by Walter C. Allen.

Mr. Towne became president of the Merchants' Association of New York in 1908 and served until 1913. He was a past president of the American Society of Mechanical Engineers, and as treasurer of the National Tariff Commission Association took a leading part in the organization to promote the adoption of scientific methods in framing tariff schedules. He also wrote on many technical problems relating to manufacturing and engineering.

CAPTAIN PATRICK F. BANNON

Captain Patrick Bannon, president and superintendent of the Farrell Foundry & Machine Company, Waterbury, Conn., since 1904, died suddenly at his home recently, shortly after returning from church. Death was due to acute indigestion. Captain Bannon was born in 1855 and was earning his own living at the age of 12, his first work being in the brass foundries of this city. He was the second captain of Company G, old 2nd Connecticut Regiment, and had held many city offices.

ERNEST ROTH

Ernest Roth, president Western Clock Company, and vice-president Matthiessen & Hegeler Zinc Company, La Salle, Ill., died at his home on October 2, following a stroke of apoplexy. He was 68 years of age.

Mr. Roth was born in Neckargartach, Germany, February 11, 1857, son of Wilhelm and Johanna (Hagner) Roth. His home was in Germany until he was about twenty-four. He was educated in public schools, in the gymnasium at Schwaebish Hall and finally at the Polytechnic Institute at Stuttgart. He was graduated from there in 1879. During 1876-1877 he practiced his profession of civil engineering, and then resumed his technical studies at Stuttgart. In 1879-1880 he served his military duty. In 1881 he came to America, and for five years his headquarters were in the City of Mexico. In 1886, severing his connection with the Mexican Central, he located at St. Paul, Minnesota, and entered the service of the building department of the Chicago, Burlington & Northern, now part of the Burlington System. He was there one year, and in 1887 made his acquaintance with La Salle, Ill.

ERNEST ROTH

In June, 1889, he was called by F. W. Matthiessen to take charge of the Western Clock Company, and was made manager of that institution. It was a comparatively small business thirty-five years ago. Its growth and destiny have been in the hands of Mr. Roth. In November, 1922, he was elected president, and his title has since been president and general manager of the Western Clock Company.

He married, June 14, 1888, Miss Fannie Gillmann, a native of Wisconsin. Three children were born to their marriage: Mildred Roth, now Mrs. John D. Lent; Eda Roth, now Mrs. G. T. O. Becker, and one son, Ernst C. Roth, who married Mildred Morgan.

JAMES HENRY PILLING

James Henry Pilling, of Waterbury, Conn., with his brother, founder of the Pilling Brass Company of that place, died at the age of 61 years at his home, 249 Columbia Boulevard, Sept. 24, after a long illness.

He was born in Stonington, Conn., May 12, 1863, the son of William and Isabella Pilling. He was of English and Scotch parentage. After leaving school he worked for a time in a dry-goods store but came to Waterbury in 1878 as an employe of the Scovill Manufacturing Company. A few years later he became a clerk in the post office, which position he held for six years, returning to the Scovill company to be paymaster.

In 1907 he was appointed by the President as postmaster of Waterbury. About the same time, with his brother, John W. Pilling, he organized the Pilling Brass Company although he held no office in the firm until he retired as postmaster in 1915 when he became secretary of the company.

He was a member of the Odd Fellows and the Elks and was a Republican in politics. He was active in city affairs from 1895 until 1908, holding the offices of councilman, alderman, president of the board of aldermen, member of the board of charities and city treasurer. He is survived by his brother, John W. Pilling, of Baltimore; two sisters, Miss Mary E. Pilling and Mrs. Elizabeth G. Gault, both of Waterbury.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

NOVEMBER 1, 1924.

According to the will, just published, of **Charles H. Harrub,** chief engineer for the Waterbury Brass Company, and its successor, the **American Brass Company** for over 40 years, whose death was recorded in these columns two months ago, all his fortune is set aside for public and charitable purpose.

His wife died shortly before him and his only other relatives are a nephew and a niece, who are left nothing under the will. Two years ago, he established a trust fund amounting to $125,000 to be given the city on his death for the erection of two memorials. One is to be in memory of his wife and will depict the virtues of the Pilgrims Fathers, and the other is to be a suitable war memorial. The balance of his estate, amounting to $50,000 becomes a trust fund, the income from which is to be divided among two local churches and charitable associations. **John P. Elton,** former president of the Waterbury Brass Company and vice-president of the American Brass Company, is named chairman of the commission, which will select the memorials under the terms of the will. A sculptor of national reputation will be secured to design the two memorials.

Mr. Harrub was an engineer in the Navy during the Civil War, and at its close came here, becoming chief engineer at the Waterbury Brass Company, a position which he held until he was pensioned off a few years ago. The size of his estate was surprising as it was known that he never speculated or invested his money in anything except saving banks and that his only income throughout his life was his salary which was not exceptionally large.

James Gorman, who completed 45 years of employment at the **Waterbury Farrel Foundry,** last month, has been pensioned off by the concern. He entered the plant as a blacksmith and for 33 years was foreman of the company's blacksmith shop.

Mrs. Annie O'Brien completed 45 years employment at the **Scovill Manufacturing Company,** last month. In recognition of that fact, the members of the **Scovill Girl's Club** gave her a testimonial dinner and presented her with a purse of money —45 dollars, 45 quarters and 45 cents. Throughout her 45 years of employment she has worked on but two machines. Buff machine No. 1 and Buff machine No. 2. She is known as the "mother" of the club and during the war proved the right to the name by her activities for the soldiers for whose comfort she spent all her spare time.

The inventory of the estate of **George E. Judd,** former president and treasurer of the **Mattatuck Manufacturing Company,** totals $667,167. This is represented by 14,000 shares of Mattatuck stock at $350,000; 165 shares of Scovill at $36,000, 100 shares of Waterbury Clock stock at $200,000; 500 shares of Torrington company at $18,000; 50 shares of Plume & Atwood at $5,500; 10 shares of Waterbury Farrel Foundry stock at $1,200 and stock in some 60 outside concerns.

Judge F. M. Peasley in the Superior court has declined to name the **American Pin Company** as the co-plaintiff in the suit of **Mrs. Mary E. Nicholas** for $10,000 damages against the **Connecticut Light & Power Company** for the death of her husband who was killed in an explosion at the American Pin Company plant. The Power Company had filed a motion asking the court to make the Pin Company a co-plaintiff, but the judge ruled the motion could not be granted because it was up to the Pin Company to decide whether or not it wished to appear in the case.

William H. Bristol, president of the Bristol Company, has announced his intention of constructing a memorial to his late wife in the town of Middlebury, to consist of a parkway which eliminate two or three dangerous curves on the road to Lake Quassapaug.

Stockholders of the **Anaconda Copper Mining Co.** in this city, formerly stockholders in the American Brass Company, have been advised that another of the company's temporarily closed mines has resumed operations. This is the Tramway mine, one of the largest in the Butte district. Approximately 500 men were employed in the mine before and it is expected that a like number will again be employed.

According to the local Chamber of Commerce, business is improving here. Their figures show there are 90 more hands employed in the eighth largest factories here than there were a month ago. Although the increase does not seem large, they point out that a year ago the figures showed a decrease of 304 employed compared to the preceding month.—W. R. B.

BRIDGEPORT, CONN.

NOVEMBER 1, 1924.

Judge Edwin S. Thomas, of the United States District Court, for Connecticut Company, has appointed **Atty. Henry Greenstein,** of this city, as temporary receiver of the **Bridgeport Iron & Metal Company,** upon an involuntary petition in bankruptcy filed against the concern by three creditors. Judge Thomas also directed that the business be discontinued.

Lewis Brothers, of New York, who have a claim of $275 against the concern alleges that its liabilities amount to $200,000 and that its assets will not exceed $100.000. The **Bridgeport Iron & Metals Company** was organized in 1916, with an authorized capital of $200,000. **William Olderman** is president; **Philip Norvitz,** vice-president; **William Weinberg,** of New York, secretary; and **Edward Goldenberg,** treasurer. The company has two subsidiaries, the **Acorn Merchandise Company,** of New York, and the **Fairfield Metal Company,** of Bridgeport.

It is expected that later on, examination of the officers of the company will take place as the petition has asked for such examination to determine the cause of the alleged failure and the relationship between the firm and the two subsidiaries named. The petitioners claim that while the firm was insolvent, $1,000 was paid to certain creditors.

A sales conference of the eastern sales managers of the **Dictaphone Corporation** was held here last month. It was called expressly for the purpose of analyzing current business conditions in order that the sales force might be sent out to capitalize the present optimistic outlook on trade. It was felt by the company that industries in the west and other sections of the country were considerably more enterprising than conservative New England in the study of markets before tackling their quest for sales, and the company did not wish to make this error. **C. K. Woodbridge,** president of the Dictaphone corporation addressed the conference, **L. C. Stowell,** vice-president in charge of sales, **A. V. Bodine,** assistant to the president and general plant manager, and **J. L. McIntosh,** treasurer. All the territory east of the Mississippi river was represented at the conference.—W. R. B.

TORRINGTON, CONN.

NOVEMBER 1, 1924.

Frederick L. Braman, vice-president of the **American Brass Company,** was re-elected president of the **Charlotte Hungerford Hospital,** at the annual meeting held in October. During the year ending October 1, a total of 1,134 patients were admitted to the hospital, a substantial increase over the total for the preceding year.

Frederick W. Fuessenich, treasurer of the **Hendey Machine Company,** was nominated by the Democratic Party for State Senator from the 30th district, an office once filled by his father, **Frederick F. Fuessenich.**

Francis H. Griffiths, president of the **Turner & Seymour Manufacturing Company,** has been re-elected president of the **Torrington Y. M. C. A.**

On October 15, a pistol team representing the Torrington

police department and captained by **Major William E. Besse**, superintendent of the **Torrington Branch** of the **American Brass Company** defeated a New York police department team by 1,125 to 1,095. There were three strings of slow fire and two of rapid fire, five shots to a string. All the members of the Torrington team are engaged at the American Brass plant. Their names: **Major Besse, James Burke, Charles E. Bennett, Frank W. Klein, Clinton A. McCarty, Henry Perregaux, J. F. Ackerman and Arthur E. Brimble.**

General conditions in Torrington metal industrial plants showed but little change in October, due perhaps to pre-election uncertainty. Manufacturers as a whole, however, are highly optimistic over the outlook and it is freely predicted that with the election out of the way things will begin to hum.

Mrs. Charles E. Bennett, whose husband is mechanical supervisor at the **Torrington Branch** of the **American Brass Company,** died October 6, at the Hartford Retreat, where she had been a patient for about two months suffering with a nervous breakdown. Death was due to pneumonia. Mrs. Bennett was a native and lifelong resident of Torrington. Besides her husband she leaves her mother, two sons and a brother. The funeral was held October 8, with burial in Torrington.—J. H. T.

NEW BRITAIN, CONN.

NOVEMBER 1, 1924.

Manufacturing conditions generally among the metal manufacturing concerns in New Britain are showing an upward trend at this writing and at several of the concerns a survey shows unusually optimistic conditions. The **Stanley Works** report business good, the several branches of the **American Hardware Corporation** are finding business picking up, **Landers, Frary & Clark** continues to show good reports and the same, in general, holds true of many other concerns.

Encouraging news to the stockholders of the **Traut & Hine Manufacturing Company,** which has recently reorganized on a more substntial business footing, is that the Hartford Stock Exchange shows an increasing demand for the stock. All summer there has been practically no bidding, but recently it sold actively at $9. This indicates a restored confidence. Sales reports for September show that month to have been the best of the year. On October 15, 1924, the firm paid off all its banking and merchandise creditors to date, certain important financial transactions having made this possible. The sales force is being augmented and several new lines are being worked up for manufacture. These will take the place of the household utensils rights of manufacture of which have been sold to the Humphrey Manufacturing Company of this city. The Traut & Hine Company has increased its working schedule in most departments from four to five days a week and while no new hands are being taken on production is being stimulated.

Recent changes at the factory include the resignation of **Ernest N. Humphrey,** factory manager for a number of years. Mr. Humphrey has organized the **Humphrey Manufacturing Company** in this city and is engaged in making household utensils, such as egg beaters and other kindred articles. **Harry Brown,** purchasing agent at the factory, also has resigned as has Sales Manager **Dean** of the hardware division. Judge **John H. Kirkham** and **Joseph Carney** have taken places on the board of directors to succeed Humphrey and Brown.

A. Buol, formerly with the New Britain Machine Company as superintendent, now is conducting his own factory here and finds business very good.

The **New Britain Machine Company** is showing steady improvement and some of the branches are working overtime. —H. R. J.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

NOVEMBER 1, 1924.

With election but two weeks away and the end of 1924 almost in sight business conditions in the various industries employing non-ferrous metals are actually looking up. Inquiry about the city today indicates greater confidence in the immediate future, and a real belief that activities are soon to be resumed on a much larger scale.

Production in Rochester metal trades has been very much circumscribed during the past six months, but the tendency of late has been one of gradual improvement. In fact, during the closing month much more business has been transacted, particularly among the brass foundries and plating shops about town. Much building has been done in Rochester since spring, which has been of value to the various foundries, demand for copper, brass and aluminum fixtures and appliances being abnormally large this year.

The several stamping and can companies in Rochester have been quite active this fall, particularly the latter, demand from preserving concerns being heavier than in recent years.

No new industries have been reported for many months, but it is expected that with the political scramble over improvement in business will become apparent at once.—G. B. E.

TRENTON, N. J.

NOVEMBER 1, 1924.

The Trenton metal industries report business as being good at this time and do not expect it to drop any during the coming winter months. The **Jordan L. Mott Company,** which went into the hands of receivers some time ago, reports an increase in the volume of business. **Charles H. Baker** and **Robert K. Bowman,** receivers of the Mott Company, have issued this statement:

"Notwithstanding financial readjustments made necessary in the Mott Company, it is most gratifying to us to bring to your attention a new area of progress which eclipses all our previous records. Shipments of Mott products during the months of July and August were proportionately larger than any two months in the history of the company, which clearly demonstrates the confidence of the trade in our ability to serve.

Under the name of **Mercer Motor Company,** title to the deed of the Mercer Motors Company, has been acquired by a newly acquired concern, the cash consideration being nominal, while mortgages and other encumbrances assumed were more essential factors. **Frank Curran,** of Ventnor, N. J., is president of the concern; **John L. Kuser,** of Bordentown, is one of the vice-presidents, and **William T. McDevitt,** of Philadelphia, secretary and treasurer. Other officers will be named later. The plant has been idle since last December, but operations are expected to begin soon, when both four and six cylinder automobiles will be produced. The cars will be of high quality and will be among the most expensive in the country.

The **John A. Roebling's Sons Company** recently submitted a questionaire to its many employes and about 40 per cent answered in time for tabulation. The questionnaire was on prohibition, politics and daylight saving. Results showed that a large majority of the workers favored the return of the old saloon system and the permanent adoption of daylight saving each summer. The workers cast a large majority for Coolidge and Dawes.

S. Leslie Tattersall, of Trenton, has been appointed by Vice Chancellor Buchanan as temporary receiver for the **Bertrand F. Miller Company,** Trenton, N. J., manufacturers of radio apparatus. The application was brought by two stockholders of the concern and seeks to compel the conveyance of the property used by the firm from B. F. Miller to the company. The firm's assets are given as $10,000, while the liabilities are placed at $9,000.

Foreclosure proceedings have been instituted in the Court of Chancery by the Mercer Trust Company against the **Trenton Zinc and Chemical Company,** Trenton, N. J. Papers in the case set forth that Morris and Max Movshovitz of the zinc company in March, 1919, became indebted to the trust company to the extent of $15,000, and that the obligation remains unpaid. Two houses and a parcel of ground will be sold to satisfy the claim.

Columbian Bronze and Foundry Company, Anderson avenue, Fort Lee, N. J., has been incorporated at Trenton, N. J., with 10,000 shares no par value to manufacture hardware and hardware supplies and composition of which metal is a factor. The incorporators are **Lester C. Burdett,** Fort Lee, N. J.; **Joseph J. Miller,** 320 Broadway, New York City, and **Albert R. Lindman,** 50 Broad street, New York City.

William P. Laytham & Sons Company, 899 Market street, Paterson, N. J., has been incorporated at Trenton, N. J., with $200,000 capital to manufacture iron, brass and aluminum castings and metals of every kind and description. The incorporators are **William P. Laytham,** 76 Passaic avenue, Passaic, N. J.; **Harry Meyers,** Hobart Trust Building, Passaic, and **Ruth Troy,** 466 East 39th street, Passaic, N. J.

The following concerns have been chartered here: **Leo Weiner Manufacturing Company,** manufacture jewelry, Newark, N. J., $125,000 capital; **Clinco Laboratories,** chemicals, Camden, N. J., $10,000 capital; **Arlington Plating Laboratories,** electro-plating, Harrison, N. J., $50,000 capital.—C. A. L.

PHILADELPHIA, PA.

NOVEMBER 1, 1924.

There is a more optimistic view of the possible recovery in the near future of the non-ferrous metal trades. Brokers feel that with the slightly advancing prices consumers soon will be in the market. Everywhere there seems to be this tone in direct contrast to the views held last month by the entire trade. No particular factor predicates the market. Rather a number of undeniable signs of better business with a continual improvement.

Brass prices and market conditions are virtually the same as copper with the exception of a slightly better inquiry. This is principally due to the increased demand for brass pipe of all sizes for plumbing and other purposes. Brass rods and sheet are quiet with little change of the general trends noticeable during the past month or six weeks.

Platers report that some small advance orders are coming in to the market and that the "feelers" have apparently disappeared, much to their satisfaction. However, there is not such an improvement in the industry to warrant the saying the business offered is in fair volume. Philadelphia, being a center of lamp and lighting fixture trade, soon will recover from the slump of the summer season with a rush, for many people not already enjoying the advantages of electricity will purchase equipment, if for no other reason than to have their home electrified for the holidays which are not so distant.—A. F. C.

PITTSBURGH, PA.

NOVEMBER 1, 1924.

W. W. Dudley, organizer and vice-president of the **Dudley Watch Company,** of Lancaster, Pa., has severed his connections with the firm. His sons, **Arthur** and **Clifford,** have also resigned from the executive offices.

Baling-press dealers report a marked increase in volume of business in the last four weeks. Consumers are more interested than they have been all summer. Prices are unchanged.

Through the co-operation of the **Sheet Metal Contractors Association,** of Pittsburgh, and Local Union No. 12, **Amalgamated Sheet Metal Workers'** International Alliance, approximately 65 sheet metal apprentices will attend class one day a week during the coming year at Carnegie Institute of Technology, according to a report from the institute authorities. The course of instruction includes geometrical drawing, mathematics, pattern drafting and ship practice. Beginning the week of October 6, evening classes for this group of apprentices were resumed in mathematics, mechanical drawing and shop work.—H. W. R.

MIDDLE WESTERN STATES

INDIANAPOLIS, IND.

NOVEMBER 1, 1924.

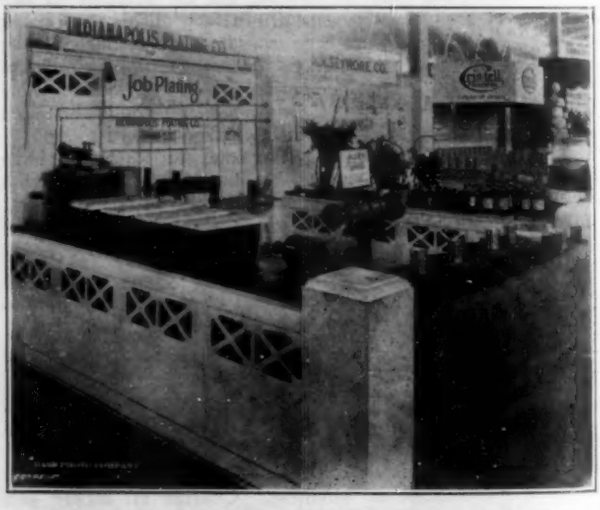
The metal trade in Indianapolis is enthusiastic over the results obtained and the interest aroused in the Industrial Show which was held at the State Fair Grounds from October 11 to October 18. A similar show was held in 1921, but the display this year so far surpassed the other show there was no comparison. During the seven days of the display more than 200,000 persons inspected the exhibits, which is believed to have set a record for attendance at such exhibitions. The

PIONEER BRASS WORKS, INDIANAPOLIS, IND.

show was held in a new building erected this year by the State, the building is said to be the largest building for display purposes in the Middle West. It is more than 800 feet long and when arranged for display purposes, has more than two miles of aisle space. One day during the show more than 65,000 persons attended, by far the largest crowd attending any function ever held in Indiana.

Among the trade's exhibitors were: **Bronze Piston Ring Company, Inc., Central Plating Company, Indianapolis Brass Company, Indianapolis Plating Company, Pioneer Brass Works** and the **Universal Brass Works.**

It is well known among the trade that the general public knows but little about how anything is given its coating of silver, nickel, or other plating. For this reason the



INDIANAPOLIS PLATING COMPANY, INDIANAPOLIS, IND.

Indianapolis Plating Company, during the recent Industrial Exposition in the state fair grounds, at Indianapolis, tried to show the public how it was done. As part of its exhibit, the company did plating without anything hidden, up the sleeves or concealed in any way. As a result the booth was extremely

popular, but even though it looked easy, there will be no home platers.

Joseph Zeigler, of Anderson, founder of the **Zeigler Manufacturing Company,** of Alexandria, Ind., manufacturing metal products, was made defendant in a suit filed in the Madison county superior court recently demanding $100,000 damages. The plaintiffs are several in number, all living in Indianapolis. They assert that they were stockholders of a company that bought the Zeigler metal products plant at Alexandria and charge they were deceived by the defendant and that there was collusion and fraud by the defendant's son, **Lester Zeigler,** and Roscoe McFall, who became the receiver for the plaintiff's interest in the factory, which was bought by Joseph Zeigler.

The **Western Brass Works** have opened a foundry at 1006 South Holmes avenue, Indianapolis, Ind.

The **Auto-Lead Machine Company,** Plymouth, Ind., has been incorporated with a capital of $50,000 to manufacture vending machines.

Lon R. Smith has been appointed manager of the windshield division of the **Senite Metal Company,** of Indianapolis. Mr. Smith formerly was western representative of the **Eisemann Magneto Company,** sales manager of the **Buda Company,** vice-president in charge of sales and advertising of the **Midwest Engine Company** and for three years was a member of the council of the Society of Automotive Engineers.

C. A. Barrow is the new owner of the plating shop at 715 Massachusetts avenue, Indianapolis.

The **Indianapolis Metal Treating Company** has moved its shop to 14 East South street and the **Quality Plating Company** has occupied a room at 16 East South street, Indianapolis, Ind.—E. B.

DETROIT, MICH.

NOVEMBER 1, 1924.

No outstanding feature has developed in the copper and brass situation here for the last several weeks. Practically all the plants are operating, but naturally on a considerably reduced scale the same as most other lines. As every one knows this branch of the metal industry in Detroit is largely dependent for its success on the automobile industry. The latter has been, and is now, passing through a considerable depression, which naturally is being felt quite keenly by every industry dependent on it. There is, however, considerable optimism expressed and it is believed that just as soon as the presidential election is settled, business will begin to show a decided improvement. The forecast for 1925, even at this early date, is most favorable.

President C. G. Smith, of the **Joseph N. Smith Company,** announces the appointment of **F. E. Brown** as head of the engineering and production department. He will, it is understood, become and officer and director of the company, which plans notably to expand operations of its windshield division in its recently acquired plant at Federal avenue and the Michigan Central Railroad.

The **Dehco Baked Enameling Company** has been incorporated at East Lansing, with a capital stock of $10,000. The stockholders are H. Lee Bancroft, Lowell Black, R. V. Abel and H. R. Risinger, the latter being from St. Louis, Mo. The address is 111 North Harrison street, East Lansing, Mich.

The **Unique Brass Manufacturing Company** is one of the concerns to incorporate in Detroit. Its capital stock is $150,000. The stockholders are John Grace, Jr., Robert Grace and George Grace. The address is 1250 Campbell avenue.

The **McCord Radiator & Manufacturing Company** held its annual sales convention in Detroit during the week of November 2. This year, the silver jubilee of the organization is reported as proving the biggest in its history and expectations are that next year will be even larger. This company manufactures copper asbestos gaskets, radiators for Ford cars and other metal products. Thursday evening, November 6, the company banquet was held at the Detroit Yacht Club. The following Saturday every one attended the Michigan-Northwestern football game at Ann Arbor.

A. C. Hamilton, until recently sales engineer of the **General Aluminum & Brass Manufacturing Company,** Detroit, and formerly chief engineer of the **Oakland Motor Car Company,** Pontiac, has opened offices in the Central Motors building, representing the **Hoosier Clutch Company,** of Muncie, Ind., which has recently brought out a new style of clutch, incorporating a number of novel features.

The **Michigan Valve, Foundry and Engineering Corp.,** Detroit, has changed its name to the **Michigan Valve, Foundry and Engineering Company.**—F. J. H.

CHICAGO, ILL.

NOVEMBER 1, 1924.

Indifference still seems to mark the general condition of the metal market in Chicago, the dealers in this vicinity with few notable exceptions declaring that developments during the past few weeks have been keenly disappointing.

Smiling in the face of the lugubrious atmosphere which some of the dealers have tended to create is the **Federated Metals Corporation,** according to **R. G. Raphael,** sales manager. Mr. Raphael declared business was better, and corporation officials feel a great deal more optimistic at present than they have for some time.

The **Globe Metal Company** was the only metal concern in Chicago to provide an exhibit at the convention of the American Foundrymen's Association, in Milwaukee, held October 11 to 16. **George Birkenstein,** purchasing agent, was in Milwaukee attending the convention, supervising the exhibit for his company.

The company recently suffered a loss of about $5,000 due to a fire of unknown origin that broke forth in the rear of the company's yard in Chicago. Several sheds were destroyed, and two freight cars on a siding near the plant were partially damaged also. **Louis Birkenstein,** president, is expected to return home from Europe about November 1. Mr. Birkenstein is at present in Paris. He has been traveling over the continent accompanied by Mrs. Birkenstein for several months past.

A. J. Lunn and **Charles Yates,** trading as the **North Chicago Brass Works,** have recently had an involuntary petition in bankruptcy filed against them. Claims of their creditors totaled $8,690.60.

Two representatives of the metal industry were among the speakers at the convention of the **National Industrial Advertisers' Association,** at the Edgewater Beach Hotel, Chicago, Oct. 13 and 14, 1924. **T. H. Bissell,** of the **International Nickel Company,** New York, was one of four men who made five-minute talks on "Industrial Advertising Successes of 1924." **A. D. Guion,** of the **Bridgeport Brass Company,** Bridgeport, Conn., led the discussion following a speech by **F. R. Davis,** of the **General Electric Company,** Schenectady, N. Y., on "Strategy in the Manipulation of Mediums and Space."—L. B. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

OCTOBER 17, 1924.

Several departments of the metal industries are showing improvement. Manufacturers of nickel in various forms find an improved demand. Large quantities are called for for the motor industry, and for such domestic goods as spoons and forks orders are increasing. Australian demands are improving. In the electro-plate department the preference appears to be for cheaper ware. Some Birmingham firms have derived excellent orders for presentation vases, coffee services, tea caddies, etc., by large firms who have taken the opportunity of the Wembley exhibition to cultivate custom by means of this form of advertisement. Australian and Canadian orders for silver and electro-plate have increased and there is more buying from South Africa, South America and Scandinavia.

The large orders placed for locomotives and for railway rolling stock have in many ways assisted the metal trades. Makers of copper tubes and sheets are busier, the latter for many kinds of stamping purposes, but there are increasing complaints of Continental competition, Germany being much more in evidence, and for export business manufacturers frequently find that they have to reduce the price by as much as 25 per cent.

The question of the opening next year of the Wembley exhibition is still undecided, although the tendency of opinion appears to be that a second season will be taken. Birmingham non-ferrous exhibits have occupied a most important position in the Palace of Engineering and the exhibitors are fairly satisfied with the result. But the general attitude of the exhibitors in this line does not favor a second venture next year, in view of the fact that the industries represented do not furnish much scope for variation from the stands as they now appear. In any event, therefore, it is likely that the metal exhibitors will prefer to make an interval before reappearing in a similar exhibition.

The Kings Norton Metal Works, Birmingham, has secured the contract for the minting of the new Lithuanian copper-aluminum coins, this company's being the lowest tender. Belgium and Dutch mints came next, but tenders were also sent in from French, German and Swiss and firms of other countries.—G.

Business Items—Verified

The **Egyptian Lacquer Manufacturing Company** is now located at 90 West Street, New York.

The **White Metal Manufacturing Company,** Hoboken, N. J., announces that it has no intention of erecting a plant in Toronto, Can.

Eastern Felt Company, Winchester, Mass., has awarded contract to Thomas C. Davis, Newton Highlands, Mass., for additional power plant.

A. & D. Capece are now located at 369 37th street, Brooklyn, N. Y., where they have opened a shop for job plating in all metals, making a specialty of nickel automobile work.

The **Bridgeport Brass Company,** Bridgeport, Conn., is sending out sample brass tacks as an example of the output of electric furnace brass. Samples can be obtained on request.

The **Hartford Molded Products Company,** Hartford, Conn., has been incorporated with $100,000 capital to produce metallic molded products by Harrison B. Freeman and others of Hartford. The molding of Bakelite is the only operation at present.

The **Capital Brass Foundry,** 206 South West Temple Street, Salt Lake City, Utah, has recently made an interesting bronze Soldier Memorial tablet. Its size is 48 x 63 inches and weight 816 pounds.

Reliance Electro Plating Company has opened a shop at 93 Crosby street, New York City, for job plating in all metals. This firm operates the following departments: plating, polishing, lacquering.

The **Reliable Pattern & Castings Company,** Cincinnati, Ohio, recently incorporated by Elmer A. Young, Edward Korten and Arthur Kuhn, all of Cincinnati, is in the market for brass foundry equipment.

The **National Cash Register Company,** Dayton, Ohio, has through F. S. Moseley & Company and the Union Trust Company issued 10,000 shares of 7 per cent cumulative preferred stock, par value $100.00.

The entire plant at the **West Virginia Metal Products Corporation,** located near Fairmont, W. Va., is offered for sale at a price that represents less than one-third its actual cost. This plant was described in THE METAL INDUSTRY for December, 1920.

The **Diamond Power Specialty Corporation,** Detroit, Mich., manufacturers of the Diamond Valv-in-Head Soot Blower, will have an exhibit in Booth 17, at the Mechanical Engineering Power Show, Grand Central Palace, New York City, December 1 to 6, 1924.

New International Brass & Bronze Company has opened a shop at 9 Baxter street, New York City, to manufacture theatre, bank and office specialities in brass and bronze. This firm operates the following departments: plating, polishing, lacquering, brass machine shop.

R. Jimmerson & Company, formerly of Providence, R. I., are now located at 174 Fulton street, Brooklyn, N. Y. They manufacture specialties in lamps and metal mountings for same. This firm operates the following departments: spinning, soldering, polishing, plating, lacquering.

Cutler & Zucknow have fitted up the third floor of 125 Baxter Street, New York City, as a shop where they will do job spinning in all metals as well as the manufacture of sheet metal goods to order. This firm operates the following departments: tool room, spinning, soldering, stamping, polishing.

Arkansas Foundry Company, Little Rock, Ark., has rebuilt a portion of its plant at East Sixth street, recently damaged by fire. This firm operates the following departments: brass, bronze, and aluminum foundries; brass machine shop, tool room, grinding room, casting shop, cutting-up shop.

Royal Silver Manufacturing Company, 22nd street, Norfolk, Va., manufacturer of plated ware, metal specialties, etc., plans the construction of a one-story addition to cost approximately $25,000 with equipment. This firm operates the following departments: grinding room, plating, stamping, polishing, lacquering.

South & Winchester Manufacturing Company, South Windham, Conn., will construct a one-story addition to its foundry, 48 x 90 feet. The company operates gray iron, brass and aluminum foundries. This firm operates the following departments: brass, bonze, and aluminum foundries; tool room, casting shop.

Chas. F. L'Hommedieu & Sons Company, Chicago, Ill., have just placed contract for another mill construction warehouse on their property, adjoining present warehouse and the main line of the C. B. & Q. R. R., with switch track facilities, at an estimated cost of about $10,000; floor space about 5,000 sq. ft. Building operations will start immediately.

Eight river pirates, evidently looking for a consignment of narcotic drugs brought to New York on the **White Star** liner **Olympic** and destined for various drug firms, held up three watchmen on Pier 59, North River, at the foot of West 18th street, on October 5th at five o'clock in the morning, and stole ten heavy boxes of copper, which they mistook for gold.

The **Globe Electric Supply Company,** 1843 Wazee street, Denver, Col., has been appointed district representative for the Kuhlman Electric Company of Bay City, Mich. The territory involved includes the states of Wyoming, Colorado and New Mexico. The Kuhlman Company expects to have a stock of transformers placed shortly with this new representative.

Cornell University and the **University of Michigan** have ordered X-ray diffraction equipments for use in their physics laboratories. The metallurgical, geological and other departments will also use the outfits. The equipments will be furnished by the **General Electric Company,** in whose research laboratory this X-ray method of studying crystal structure was developed.

The **B. C. Valve Company,** Vancouver, B. C., Canada, will build a plant to cost about $22,000. The company is in the market for about $50,000 worth of equipment for the manufacture of steam, water, gas, oil and fire fittings and general brass finishing. Departments operated are: brass, bronze and aluminum foundry; machine shop; tool, grinding, plating, polishing, japanning and lacquering rooms; fettling shop.

The **Gem Manufacturing Company,** 1229 Goebel street, Pittsburgh, Pa., manufacturer of oil cans, torches, lamps, etc., has awarded general contract to D. T. Riffle, 1106 Forbes street, for a one-story addition, 80 x 130 ft., including alterations and improvements in present factory, estimated to cost $30,000. This concern operates the following departments: grinding room, plating, stamping, polishing.

The **Novelty Manufacturing Company,** Baltimore, Md., has been organized to manufacture metal buttons, manicure sets and specialties for the automotive trade. Two floors have been leased, comprising 10,000 sq. ft., and preparations will be

made to get under way as soon as possible. Louis Schmidt is president. This firm operates the following departments: japanning, stamping, polishing, lacquering.

J. **Holland & Sons,** have just opened up a branch of their polishing and plating equipment and supplies at 13 Union Avenue, Brooklyn, N. Y., where they will handle dynamos, generator sets, tank anodes, buffing and polishing machines, chemical, also wood-working and metal-working machinery. They will be able to accommodate the trade with more used plating equipment. Main office 489 Broadway, Brooklyn.

The **Skelton Lead & Zinc Company,** of Douthat, Oklahoma, has arranged a group life insurance program for the benefit of its employes under which 150 workers are insured for a total of $240,000, the coverage for individuals ranging from $1,500 to $4,000. The insurance, written by the Metropolitan Life Insurance Company, was issued on a co-operative basis whereby the mining company and its employes jointly pay the premiums.

Armstrong Cork & Insulation Company, Pittsburgh, Pa., announces the following changes in branch office addresses: Cleveland office is now located at 2207-2221 East 14th Street; Houston office at 903 Keystone Building, Houston, Texas. New warehouse facilities have been established at this city and the company's products are now carried in stock. New Orleans office, H. T. Steffee, agent, has been moved to 928-930 Tchoupitoulas Street.

A solid cast bronze door for the main entrance of the **Bank of Boston,** Buenos Ayres, has been made in Birmingham in the foundries of the **Birmingham Guild, Limited,** Grosvenor street, West Birmingham. It is the largest metal door that has ever been produced in Great Britain, the height being 20 ft., the width 11 ft., and the weight 3½ tons. It will be fitted with electric gearing for raising and lowering. The decorated panels and borders are finely chased.

Announcement is made by the **Newark Wire Cloth Company,** Newark, N. J., that it has established a new branch office in the New England States. The address is 66 Hamilton street, Cambridge, Mass., with John G. Loring in charge. A new factory of over 30,000 sq. ft. ground area has just been completed on Verona avenue in Newark. This company manufactures all varieties of wire cloth from a 4 in. space of heavy wire down to meshes of 325 wires per inch.

B. **Mercil & Sons Plating Company,** 1907 Fulton street, Chicago, Ill., is building an addition to its plant. When this is completed early in November, it will give the company about 25,000 sq. ft. of floor space. The installation of full automatic plating equipment will further increase its capacity. A sand blasting department will be installed in the enlarged plant. This will be in addition to its present facilities for doing mechanical finishing in nickel, brass, copper, cadium and black oxidizing.

The **Unique Brass Manufacturing Company,** of Detroit, Mich., has expanded its group insurance program to include health and accident protection for its employes. Under this plan employes are entitled to a weekly benefit of $15 for a maximum of thirteen weeks. Premiums are to be paid jointly by the company and the workers. In April, 1923, group life insurance was given free of cost to its workers by the Unique company. The total life coverage amounts to $54,600. Both the accident and health insurance and the life insurance were taken out with the Metropolitan Life Insurance Company.

Announcement has been made of the launching of the **Lehigh Institute of Research** by the administration of Lehigh University. The management of the new organization, which was authorized by the Board of Trustees on April 25, 1924, is vested in a Board of Directors composed of thirteen members of the university's staff, including president **Charles Russ Richards.** Each man is a recognized authority in his special field. The first fellowship of this kind has just been founded by the **New Jersey Zinc Company.**

Barnes Zinc Products Company, 900 Blackhawk Street, Chicago, Ill., recently incorporated with $200,000 capital stock, has acquired 90,000 sq. ft. of land with private switch on the Chicago, Milwaukee & St. Paul Railroad. The first unit of its buildings will contain about 50,000 sq. ft. of floor space. It will manufacture conductor pipe, eaves trough elbows and fittings, of zinc, copper and galvanized steel. W. M. Sawyer, formerly assistant manager of the Wheeling Corrugating Company, Chicago, will be general manager. This company operates the following departments: tool room, cutting-up shop, galvanizing, stamping, soldering. It is in the market for 1 complete wire eave trough hanger outfit; 1 slip joint eave trough machine; 1 conductor pipe machine for 5 and 6 inch-round corrugated conductor pipe and square corrugated conductor pipe.

CONTRACT SERVICE

The Diamant Tool & Manufacturing Company, 91 Runyon street, Newark, N. J., manufacturer of tools, die sets, machinery, has announced that it is in the market for contracts for the manufacture of articles which are to be made chiefly of metal by stamping and machining operations. This company has a modern plant and organization to take hold of problems of this type, and is ready to design and build tools and machinery of all sorts.

SIMPLIFY SHEET METAL WARE

Initial steps have been taken by the sheet metal ware industry to secure the co-operation of the Division of Simplified Practice in reducing the number of varieties cataloged in the production of that industry. At a recent meeting in Buffalo three committees were named, one for enameled ware, one for tin ware, and one for black iron and galvanized ware. Members of these committees have been asked by Warren S. Smith, secretary of the association, to submit their suggestions as to further steps.

GOVERNMENT OWNERSHIP

In an address delivered in Washington, D. C., September 29, 1924, Secretary Hoover discusses the problems of Government ownership of public utilities, showing that a project of this kind would mean the undertaking of the management of $40,000,000,000 worth of property. His speech explained clearly and briefly his objections to Government ownership on such a scale, based on the fact that in order to engage in interstate business of this sort, the Constitution of the United States would have to be re-written in order to revise the present relation between Federal Government and the States; that Congress would be unable to manage such a business project; that a non-partisan commission to handle the work would become a tremendous and despotic bureaucracy; that past history has proved Government ownership to be inefficient and unprofitable, and would result in higher rates to the public, higher taxes to make up the deficit and poor service; that employees would be worse off working under the Government since they would be unable to combine for purpose of self-protection, and strikes not be permitted. The speech has been reprinted in pamphlet form.

RADIO EXPOSITION

Leading radio manufacturers of the United States, broadcasting stations, newspapers and other interests, united to stage a series of contests at the Third Annual National Radio Exposition, to be held at Grand Central Palace in New York, November 3 to 8, in which prizes amounting to thousands of dollars were distributed to the participants.

Guglielmo Marconi, the "Father of Radio," opened the exposition from London by a sensational feat of teledynamics. Among other features was an extraordinary demonstration of international broadcasting, when a message to Mr. Marconi from the radio fans of America was spoken across the Atlantic ocean; there was a "race against time," when two wireless messages were sent flashing around the globe from Grand Central Palace; the exhibition of new and striking innovations in the radio art, and a varied educational program.

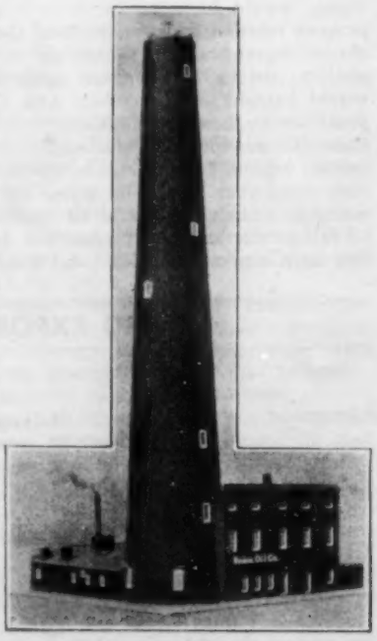
One of the unique features staged at the National Radio Exposition was a Set Assembling Contest, under the direction of A. J. Haynes, a prominent radio engineer in New York. A number of schoolboy contestants, lined up at a large working table, in full view of thousands of visitors at the exposition, began to assemble simultaneously a two-tube model radio set, at the sound of a whistle from the judges' stand. A Set Building Contest conducted on a huge scale by the United Cigar Stores Company was also decided at the exposition.

COMBUSTION FIRMS MERGE

In March of this year **Henry L. Doherty & Company** announced the acquisition, through Combustion Utilities Corporation, of the **Surface Combustion Company, Inc.**, industrial furnace engineers and manufacturers. **Combustion Utilities Corporation** has just announced the consolidation of the personnel and activities of its appliance and industrial furnace departments with those of the Surface Combustion Company, Inc. The greater organization continuing under the name of the Surface Combustion Company, Inc., will be the Utilization division of Combustion Utilities Corporation. Under the consolidation Herny O. Loebell continues as president of the Surface Combustion Company, Inc.; E. E. Basquin, vice-president and general manager; W. M. Hepburn, vice-president; Frank H. Adams, treasurer, and E. M. Doig, secretary. Paul J. Nutting, formerly in charge of Toledo Appliance Division of Combustible Utilities Corporation, becomes vice-president in charge of production. C. B. Phillips, former sales manager Toledo Division, becomes vice-president and sales manager of the Stock Furnace Division, which will include all the well-known "Improved" and "Utility" appliances, and the "Blue Line" furnaces. F. W. Manker, previously in charge of Combustion Utilities large furnace department, becomes vice-president and will be associated with Mr. Hepburn in the Large Furnace Division. The Surface Combustion Company, Inc., sales and general offices will be continued at 366-368 Gerard avenue, New York, and all production at the Toledo Works, 2288 Albion street, Toledo, Ohio.

SAVE HISTORIC SHOT TOWER

Baltimore's famous shot tower, widely known to visitors as one of the distinctive landmarks of the city, has created a wave of interest recently that has swept beyond the city limits. The present owners of the tower have threatened to demolish it and leading citizens of Baltimore are rallying to its defense. Efforts are also being made to induce the City Council to pass an ordinance empowering the city to acquire the tower and the surrounding property on behalf of the public.



BALTIMORE SHOT TOWER

Considerable historical interest attaches to the old tower. Its cornerstone was laid in 1828 by one of the signers of the Declaration of Independence—Charles Carroll of Carrollton. It is within a few feet of the highest tower of its kind ever erected—234 feet from base to crown. Made of wood-burned sand brick of uniform size and color and resting on stone foundation walls, it tapers from a base diameter of forty-four feet to a coronal of white serrated stone at the top.

The tower has been described by the committees for its preservation as a "curious and comely monument of an obsolete industrial age." It is many years since its commercial function ceased, but it was once described by the concern that owned it as furnishing "the most improved machinery for the manufacture of shot." The shot was made by ladling molten lead out of brick furnaces at different levels and pouring it through perforated basins which hung over the central shaft. The lead separated into round drops, differing in size with the length of the drop, congealed in the cooling process of falling through the air and fell into a tank at the bottom of the tower.—New York Times.

METALS IN NEW BUILDING

From the beautiful Italian Renaissance bronze doorway to the smallest hinge or bolt or lock unusual care and attention has been given to the metal work and hardware used in the new $6,000,000 office building of the Boston Chamber of Commerce. This building fourteen stories in height, is located on Congress, Franklin and Federal streets, in the heart of Boston's business.

The building was designed by the firm of Parker, Thomas & Rice. Construction work was carried on by the W. M. Evatt Company and the steel work by the New England Structural Company. The original plans called for a building of twelve stories, but legislation on building restrictions passed while the work was in progress permitted a revision so that the completed structure is fourteen stories in height. The steel work was reenforced at the fifth and sixth floors with extra members in order to be able to carry the additional floors. The exterior finish is in limestone furnished by the Central Olithic Stone Company.

The bronze door for the building was furnished by the John Polachek Company, of New York. Above the doorway is a globe flanked on either side by two beautiful ships in full sail, symbolizing commerce and industry over the world. On either side of the door in the midst of the rich ornamental design are the seals of the city of Boston and of the Boston Chamber of Commerce. All the metal work about the elevators on the first floor is of bronze. On the other floors it is of iron covered with a baked enamel finished in dark green. On the thirteenth and fourteenth floors the metal work of the elevators is painted to match the finish in the lobby.

Care has been taken that all the small details shall be artistic in effect. The brass awning supports outside the building are of a simple and pleasing design. The transoms over the doors of the offices are operated by concealed fixtures, eliminating all the ugly metal work connected with the usual transoms. The ornamental hardware has been furnished by the firm of P. Guerin, of New York. In the Main Dining Room on the fourteenth floor all the hardware is silver plated..

GERMAN METAL TRADE

Imports of non-ferrous metals by Germany in the first six months of 1924 showed a decline in comparison with the corresponding period of 1923, despite economic dislocation in that year incident to the Ruhr invasion. The smaller 1924 importation confirms the otherwise critical situation in German industry, marked by capital stringency, credit shortage and accompanying high production costs, and low activity of the productive apparatus. Imports in the first six months of 1924 are considerably below the level of the first half year of 1922, when industrial operations were more nearly normal than at present.

The exportation of non-ferrous metals increased slightly over the corresponding 1923 level, except in the case of copper and zinc, which are, however, the leading bulk commodities among the non-ferrous metals.—Trade Commissioner William T. Daugherty (Berlin, August 19). Published in Commerce Reports.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	$100	$500	$525
American Hardware Corporation.....	100	78	80
Anaconda Copper	50	36½	36⅝
Bristol Brass	25	7½	10
International Nickel, com.....	25	19¾	19⅞
International Nickel, pfd.....	100	90¼	95
International Silver, com.....	100	135	155
International Silver, pfd.....	100	106	..
National Enameling & Stamping.....	100	22⅛	22½
National Lead Company, com.....	100	154	154⅞
National Lead Company, pfd.....	100	116¼	117
New Jersey Zinc.....	100	161	164
Rome Brass & Copper.....	100	145	155
Scovill Manufacturing Company.....	..	228	235
Yale & Towne Mfg. Company, new..	..	66½	67½

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

CENSUS OF METAL MANUFACTURERS

The Department of Commerce has issued a number of reports of industries for 1923 giving statistics of their growth or decrease. Among those dealing with metals is the following:

Enameling and Japanning. Establishments engaged primarily in enameling and japanning in that year received $4,427,258 for enameling and $1,020,710 for japanning, making a total of $5,447,968. The rate of increase in this total as compared with 1921, the last preceding census year, was 116.2 per cent.

In addition, enameling and japanning are done to some extent by establishments engaged primarily in other industries. The amount received for such work thus performed outside the industry proper in 1921 was $283,148, a sum equal to 11.2 per cent of the total receipts reported for the industry as classified. The corresponding amount for 1923 has not yet been ascertained but will be shown in the final report of the present census.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President Whitehead Metal Products Company of New York, Inc.

NOVEMBER 1, 1924.

Toward the end of October there has been a noticeable improvement in the condition surrounding the metal industry, not only in brass and copper line, but also in the nickel alloys. There have been several advances in the prices of brass and copper, sheets, rods, tubes and wire, and these advances have to some extent stimulated the demand, and made the business somewhat more attractive for the producers. Taking the month as a whole, many factors in the industry felt that there was some improvement in the volume of business being placed, but there was not a sufficient amount of increase in this volume to develop a really satisfactory business for the mills. This lack of tonnage has, of course, made for the continuation of a somewhat unsettled price condition, inasmuch as the scramble for business has been rather intense, and a price cutting policy has been followed to some extent. As this is written, however, it is felt that the change for the better has come, and as stated above, with the advances that have been made in prices, there is a more satisfactory feeling prevailing throughout the trade.

A somewhat improved condition prevails in the line of nickel as covered by pure nickel, Monel metal, and various other items into which nickel enters, such as nickel silver, and the various similar alloys. In the third week in October, the International Nickel Company held a conference of Sales Representatives and Production men, at the mill at Huntington, West Virginia, and a spirit of optimism prevailed throughout the entire meeting. Many difficult corrosion problems have been solved by the application of nickel and its alloys, and as the manufacturing interests become better informed on this subject, the uses are increased.

Taking the situation as a whole, there have been no changes on the part of the producers in their general attitude toward the future, and all regard the outcome of the political situation as being the factor which will influence the general condition of business during the coming year.

Metal Market Review

Written for The Metal Industry by METAL MAN

NOVEMBER 1, 1924.

COPPER

Greater stability has marked developments in copper lately and prices scored a gradual advance as new demand became more pronounced. The market began to show an upward tendency about the middle of October, with removal of substantial buying by the domestic trade and decidedly better advices regarding the market abroad. These factors stimulated sales and inquiries, but many buyers lost a good opportunity to stock up at the minimum prices of a few weeks ago.

Consumers attitude, however, is and has been for a long time conservative. There is still considerable uncertainty as to the outlook for copper, but according to figures compiled for the information of producers there is some evidence that world consumption is running ahead of production. World production of copper for the first nine months of 1924 is estimated at 2,165,018,000 pounds, or a monthly average of 240,557,555 pounds. Shipments to domestic and foreign purchasers by North American and South American producers are estimated at 2,295,000,000 pounds for the first nine months of this year, thus indicating an apparent world consumption of 255,000,000 pounds a month.

The market on October 1 was 12⅞ cents delivered for prompt shipment of electrolytic. The price on October 29 was 13⅛c.@13½c. for prompt delivery and 13½c.@13⅝c. for the forward months.

ZINC

Recent price changes in zinc have been on the upward side of the market. While demand does appear to be specially active the better tone was due to some improvement in recent statistics. There has been a gradual increase in apparent consumption also, and domestic deliveries indicate a better outlet into domestic channels. Stocks of slab zinc in primary hands were reduced 5,202 tons in September, the quantity in smelters' hands on September 30 being 45,720 tons, the smallest since May 30. The September production amounted to 40,852 tons, being the smallest for the current year. The market is quoting 6.45c.@6.50c. E. St. Louis and 6.82½c.@6.85c. New York. Export demand was a feature lately. The tone of market gave signs of an easier trend as we close our report.

TIN

The tin market continues to maintain its reputation for quick price changes and mysterious movements. Less than six weeks ago the market was going through a period of severe depression which carried prices down to 45⅝c. Stronger tendencies set in after the September statistics were known and the market showed ability to recover on the favorable showing of large deliveries and a decrease in the visible supply of 1,069 tons.

Consumption has cut into stocks to the extent of bringing into view the strong statistical position of tin. It should be noted in this connection, however, that market values have taken all the favorable factors into consideration consistent with sound conditions. Speculative manipulations are capable of producing sudden price changes in tin, but as a matter of prudence consumers have deliberately followed a conservative policy in buying. Under the circumstances sellers have found it relatively difficult to use American demand as a lever for a bull drive. London operators are watching developments in this country with keen interest. Larger deliveries here will encourage a pretext for forcing values higher if consumers should become conspicuous buyers. As we go to press the market is firmer at 52¼c.@52¾c. on stronger London cables.

LEAD

Active demand and higher prices are the outstanding features in the market for lead. Producers of this article unlike the copper producers, are making notably large profits and find demand unabated as prices advance. There were four price advances by the American Smelting & Refining Co., in October, namely, from 8¼c. to 8.65c. New York basis. The upward movement brought manufacturers of lead products into the market on an important scale. Each advance stimulated fresh buying, and the open market reached a figure close to 9 cents. Offerings at 8.87½c. E. St. Louis found ready buyers. Demand is good and tone of market strong.

ALUMINUM

The market for aluminum appears to be on a stabilized basis at 28 cents for 99 per cent plus for virgin metal and 27 cents for the 98-99 per cent grade. Transactions have been on a moderate scale, but more active movements are expected after election.

Domestic production of aluminum in 1923 amounted to 129,000,000 pounds, as compared with 74,000,000 pounds in 1922. The importations of foreign aluminum last year reached 43,000,000 pounds, or equal to one-third of the domestic output.

ANTIMONY

Continued firmness and restricted offerings were features of the antimony market. Shipments from the East are quoted at 9¾c.@10c. c. i. f. New York. Spot material is held at 11¾c. duty paid. Considerable business was done in October. Demand from consumers has been fairly good for stock afloat or available from warehouse. A cessation of hostilities in China would be more favorable to output.

QUICKSILVER

There is an easier tone to the market for quicksilver. The foreign price declined sharply lately to £11@£11.50. Domestic quotations receded to $70@$71 per flask. Imports for first seven months of this year were 7,072 flasks, against 11,596 flasks in the corresponding period last year.

PLATINUM

There is no special activity to note in this market. Buyers purchase on a limited scale, but price of refined platinum continues to quote $118 an ounce. Trade demand has been light for several months, and manufacturers are not disposed to change their policy of caution. Imports have increased lately and supplies are consequently larger.

SILVER

The situation in silver has been particularly strong lately. The upward movement carried the price up to 72⅛ cents an ounce during the first half of October. Since then the price has reached to 69¾ cents. Prices are now the highest in over two years and with a brighter prospect for European conditions further improvement is looked forward to. Silver movements to Germany and China have been large. Foreign countries are expected to come into the market for larger amounts of silver, and new developments of importance are anticipated in the coming weeks.

OLD METALS

Increased strength and activity are noted in the markets for scrap copper and lead. The higher basis of values for these virgin metals has stimulated business in scrap material. Dealers and consumers were anxious buyers and sales were readily effected at advancing prices. New brass scrap and aluminum clips, sheets and old castings were in demand. The various grades of old zinc, however, were dull. Dealers were prepared to pay 9c.@9¼c. for light copper, 11c.@11¼c. for crucible copper, 8c.@8½c. for new brass clippings, 6¼c.@6¾c. for heavy brass, 7½c.@7¾c. for heavy lead, 5c.@5¼c. for battery lead, 3¾c.@4c. for old zinc scrap, and 21¼c.@21½c. for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1923, 14.979—January, 1924, 13.00—February, 13.125—March, 13.875—April, 13.625—May, 13.15—June, 12.75—July, 12.75—August, 13.625—September, 13.375—October, 13.25.

Brass Mill Zinc—Average for 1923, 7.479—January, 1924, 7.25—February, 7.50—March, 7.25—April, 7.00—May, 6.00—June, 6.60—July, 6.70—August, 6.90—September, 7.00—October, 7.15.

Daily Metal Prices for the Month of October, 1924

Records of Daily, Highest, Lowest and Average

	1	2	3	6	7	8	9	10	13*	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.125	13.125	13.125	12.125	13.125	13.00	13.00	13.00	.....	13.25	13.25	13.25	13.25
Electrolytic	12.85	12.90	13.00	12.95	12.90	12.85	12.85	12.90	.....	13.05	13.05	13.05	13.05
Casting	12.625	12.625	12.75	12.625	12.60	12.50	12.50	12.60	.....	12.75	12.75	12.75	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.15	6.175	6.175	6.20	6.20	6.225	6.225	6.225	.....	6.30	6.30	6.30	6.30
Brass Special	6.20	6.20	6.20	6.225	6.225	6.25	6.25	6.25	.....	6.35	6.35	6.35	6.325
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	48.375	49.25	48.75	49.00	49.625	49.25	49.25	49.75	.....	50.00	49.75	49.75	49.75
Pig 99%	49.875	48.75	48.25	48.50	49.125	48.75	48.75	49.25	.....	49.50	49.25	49.25	49.25
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.80	7.80	7.80	7.80	7.80	7.825	7.825	7.825	.....	7.825	7.85	7.85	7.85
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	.....	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	.....	29.00	29.00	29.00	29.00
Shot	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	.....	30.00	30.00	30.00	30.00
Electrolytic	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	.....	33.00	33.00	33.00	33.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	11.00	11.125	11.125	11.00	11.00	11.00	11.00	11.00	.....	11.25	11.25	11.50	11.50
Silver c/oz. Troy Duty Free	70.125	70.00	70.25	70.875	71.375	72.00	72.125	72.00	.....	71.875	71.625	71.75	71.375
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	118	.....	118	118	118	118

	20	21	22	23	24	27	28	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	13.25	13.25	13.25	13.25	13.375	13.50	13.50	13.50	13.625	13.625	13.625	12.125	13.216
Electrolytic	13.10	13.10	13.10	13.15	13.20	13.40	13.35	13.35	13.40	13.40	13.40	12.85	13.089
Casting	12.75	12.75	12.75	12.75	12.875	13.00	13.00	13.00	13.00	13.00	13.00	12.50	12.759
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	6.35	6.375	6.40	6.40	6.45	6.50	6.50	6.50	6.50	6.525	6.525	6.15	6.331
Brass Special	6.40	6.425	6.45	6.45	6.50	6.55	6.55	6.55	6.55	6.575	6.575	6.20	6.372
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	51.00	50.875	51.625	51.75	52.00	52.125	51.875	52.625	52.875	53.125	53.125	48.375	50.563
Pig 99%	50.50	50.375	51.125	51.25	51.50	51.625	51.375	52.125	52.375	52.625	52.625	47.875	50.063
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	8.00	8.175	8.35	8.50	8.65	8.875	8.95	8.90	8.80	8.80	8.95	7.80	8.175
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Shot	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Electrolytic	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	12.00	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.875	12.00	12.00	11.00	11.449
Silver c/oz. Troy Duty Free	71.25	71.25	70.75	70.50	70.75	70.00	69.625	69.875	70.125	69.75	72.125	69.625	70.875
Platinum $/oz. Troy Duty Free	118	118	118	118	118	118	118	118	118	118	118	118	118

*Holiday.

Metal Prices for November 3, 1924

Copper: Lake, 13.75. Electrolytic, 13.625. Casting, 13.125.
Zinc: Prime Western, 6.575. Brass Special, 6.625.
Tin: Straits, 53.50. Pig, 99%, 53.00.
Lead: 8.85. **Aluminum,** 28.00. **Antimony,** 12.25.
Nickel: Ingot, 29.00. Shot, 30.00. Electrolytic, Internat. Nick. Co., 33.00.
Quicksilver, flask, 75 lbs., $69.50. **Silver,** oz. Troy, 69.50.
Platinum, oz. Troy, $118. **Gold,** oz. Troy, $20.67.

Metal Prices, November 3, 1924

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9⅝to10½
Brass Ingots, Red	11¼to12¼
Bronze Ingot	12 to13
Bismuth	$2.05
Cadmium	60
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.50to$2.75
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	11½to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17½to20½
Phosphor Tin, guaranteed 5%	65 to70
Phosphor Tin, no guarantee	59 to65
Silicon Copper, 10% ...according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
11½to12	Heavy Cut Copper	13 to13¼
11¼to11½	Copper Wire	12 to12¼
9¾to10	Light Copper	10½to11¼
8¾to 9½	Heavy Machine Comp	10½to11
7 to 7¼	Heavy Brass	8¾to 9¼
6 to 6¼	Light Brass	7¼to 7½
7¼to 7½	No. 1 Yellow Brass Turnings	8¼to 8¾
8 to 8½	No. 1 Comp. Turnings	9½to10
6¼to 6½	Heavy Lead	6¾
4	Zinc Scrap	4½
8	Scrap Aluminum Turnings	10
15½to16	Scrap Aluminum, cast alloyed	16½
18	Scrap Aluminum, sheet (new)	20
30	No. 1 Pewter	32
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect Oct. 27, 1924

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17⅜	$0.19⅛	$0.21⅛
Wire	.17⅞	.19⅝	.21⅝
Rod	.15⅛	.19⅞	.21⅞
Brazed tubing	.25⅜	.....	.30⅞
Open seam tubing	.25⅜	.....	.30⅞
Angles and channels	.28⅜	.....	.33⅞

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.18⅜	$0.20⅛	$0.22⅛
Wire	.18⅞	.20⅝	.22⅝
Rod	.16⅛	.20⅞	.22⅞
Brazed tubing	.26⅜	.....	.31⅞
Open seam tubing	.26⅜	.....	.31⅞
Angles and channels	.29⅜	.....	.34⅞

SEAMLESS TUBING

Brass, 21¾c. to 22¾c. net base.
Copper, 23c. to 24c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19⅜c. net base
Huntz or Yellow Metal Sheathing (14" x 48")	17⅜c. net base
Muntz or Yellow Rectangular Sheets other Sheathing	18⅜c. net base
Muntz or Yellow Metal Rod	15⅜c. net base

Above are for 400 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	19⅝c. to 22⅛c. net base
From stock	20⅝c. to 22⅝c. net base

BARE COPPER WIRE—CARLOAD LOTS

15⅝c. to 15⅞c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	19⅝c. net base
100 lbs. to 200 lbs. in one order	20⅛c. net base

ZINC SHEET

Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	10.25 basis
Casks, jobbers' prices	11.75 net base
Open casks, jobbers' prices	12¼c. to 12½c. net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	24¾c.
15% "	26 c.
18% "	27 c.

Nickel Silver Wire and Rod

10% "	28 c.
15% "	31¼c.
18% "	34¼c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 73c. to 75c. per Troy ounce, depending upon quantity.

Rolled sterling silver 70c. to 72c.

NICKEL ANODES

85 to 87% purity	40½c.-42½c. per lb.
90 to 92% purity	43 c.-45 c. per lb.
95 to 97% purity	45 c.-47 c. per lb.

Supply Prices, November 3, 1924

CHEMICALS

These are manufacturers' quality prices and based on delivery from New York City.

Acetone	lb.	.15–.17
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.30–.35
Denatured in bbls	gal.	.50–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.17
Cyanide	lb.	.50
Sulphate, Barrels	lb.	.05¼
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22¼
Salts, single bbls	lb.	.10½
Salts, double, bbl	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.08¼
Potassium Bichromate, casks	lb.	.08¾
Carbonate, 80-85%, casks	lb.	.05¾
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.70
Nitrate, 100 ounce lots	oz.	.49½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.22
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04¼
Phosphate, tech., bbls	lb.	.03½
Silicate (Water Glass) bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.36½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.41
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base, 40.85
14 inch, 20 ply, 64/68, cloth	base, 50.80
12 inch, 20 ply, 84/92, cloth	base, 46.20
14 inch, 20 ply, 84/92, cloth	base, 62.25
12 inch, 20 ply, 88/96, cloth	base, 63.25
14 inch, 20 ply, 88/96, cloth	base, 85.15
Sewed Buffs, per lb., bleached and unbleached	base, .65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.85	2.60
" 6" 8" and over 16"	1" to 3"	2.95	2.70
" 6" to 24"	Over 3"	3.25	2.90
" 6" to 24"	½" to 1"	3.85	3.60
" 4" to 6"	¼" to 3"	4.85 }	Any quantity
" Under 4"	¼" to 3"	5.45 }	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.